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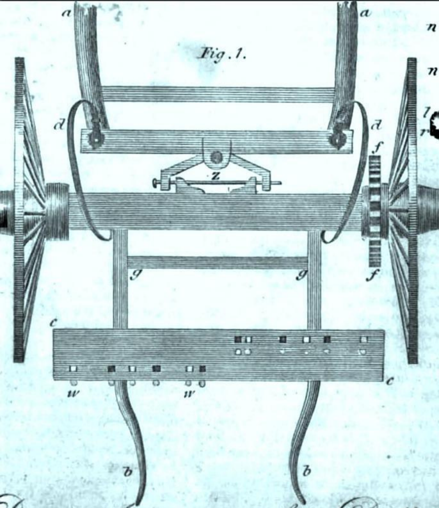

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The domestic encyclopedia

Anthony Florian Madinger Willich,
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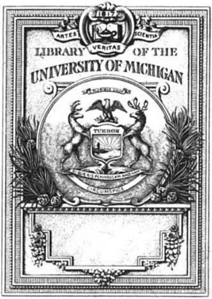

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THE

DOMESTIC ENCYCLOPEDIA:

OR

A DICTIONARY

OF

FACTS AND USEFUL KNOWLEDGE,

CHIEFLY APPLICABLE TO

RURAL & DOMESTIC ECONOMY.

WITH

AN APPENDIX,

CONTAINING

Additions in Domestic Medicine, and the Veterinary and Culinary Arts.

THE WHOLE
ILLUSTRATED WITH NUMEROUS ENGRAVINGS AND CUTS.

IN THREE VOLUMES.

VOL. II.

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AUTHOR OF THE LECTURES ON DIET AND REGIMEN, ETC.

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By Thomas Cooper, Esq. M. D.

PROFESSOR OF CHEMISTRY AND MINERALOGY.

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CONTENTS OF THE SECOND VOLUME.

☞ *The corresponding synonyms, and inversions of terms, occurring in the second volume, are marked in italics in the following table.*

PAGE
D 1
Dab *ib*
Dace *ib*
Dairy-house *ib*
Damask 2
Damaskeening *ib*
Damps *ib*
Dance 3
Dandelion 4
Data *ib*
Date *ib*
Day *ib*
Dead Men's Eyes *ib*
Dead Reckoning *ib*
Deafness 5
Deal 7
Death *ib*
Death-Watch 8
Debenture 9
Debility *ib*
Debt 10
Deca 11
Decagon *ib*
Decalogue *ib*
December *ib*
Decemviri *ib*
Deciduous *ib*
Decimals *ib*
Deciphering 12
Declination *ib*
Decoction *ib*
Decomposition 13
Decrepitation *ib*
Deer *ib*
Defamation 18
Definition *ib*
Deflagration *ib*
Degree *ib*
Deists *ib*
Deity *ib*
Delft-ware *ib*
Deliquescence *ib*
Delphinus 19

PAGE
Deluge 19
Democracy *ib*
Demurrage *ib*
Demurrer *ib*
Dendrites *ib*
Denominator *ib*
Density *ib*
Dentifrice 20
Dephlogisticated *ib*
Depression *ib*
Derbyshire Spar *ib*
Dervis *ib*
Desert 21
Design *ib*
Detents *ib*
Detonation *ib*
Dew *ib*
Dew-born *ib*
Diabetes *ib*
Diadelphia 22
Diagonal *ib*
Dial *ib*
Diameter 25
Diamond *ib*
Diana, Tree of 29
Diandria *ib*
Diapason *ib*
Diaphragm *ib*
Diarrhœa *ib*
Diary *ib*
Diastole 30
Diatessaron *ib*
Dibble *ib*
Dice 31
Didelphis *ib*
Didus *ib*
Didynamia *ib*
Diet *ib*
Dietetics 34
Digest *ib*
Digester *ib*
Digestion *ib*
Digit 35

PAGE
Digitalis 35
Digynia *ib*
Diodon *ib*
Dioecia *ib*
Diomedia *ib*
Dioptrics *ib*
Diploma *ib*
Diplomatic Letters 36
Dipping *ib*
Dipsacus *ib*
Diptera *ib*
Dipus *ib*
Dirca Palustris 37
Director *ib*
Disc *ib*
Disciple *ib*
Discord *ib*
Discount *ib*
Disease 38
Diseases of Plants *ib*
Dissenters 39
Distance *ib*
Distemper 40
Distilling *ib*
Distortion 41
Distress *ib*
Ditch *ib*
Dittany *ib*
Diuretics *ib*
Divan *ib*
Dividend *ib*
Dividing Instruments *ib*
Divining Rod *ib*
Diving 42
Diving Bell *ib*
Divisibility 43
Diurnal 44
Dock *ib*
Dock-yards *ib*
Dodecagon *ib*

PAGE
Dodecædron 45
Dog *ib*
Dog-fish 50
Dog-rose *ib*
Dogs-tail Grass 51
Dolichos *ib*
Dominical Letter *ib*
Dominicans 52
Door *ib*
Doree *ib*
Dotterell *ib*
Dough 53
Dove-tailing *ib*
Down *ib*
Drag 54
Dragon's-blood Tree
Draining 55
Drawback 61
Drawing 62
Draw-net *ib*
Dreams *ib*
Drift 63
Drift-sail *ib*
Drill *ib*
Drilling *ib*
Dromedary 71
Drone 73
Dropsy *ib*
Drossera *ib*
Drowning *ib*
Drunkenness 81
Dry Rot 82
Duck 85
Ductility 86
Duel 87
Dumbness *ib*
Dung 88
Dunkers 90
Duodecimals *ib*
Dutch-gold *ib*
Dyeing *ib*

PAGE
Dyer's Green Weed 101
Dyer's-Weed 102
Dyke *ib*
Dysentery 103
E 104
Eagle *ib*
Ear *ib*
Earth *ib*
Earth-nut 107
Earthquake *ib*
Earth-worm 108
Earwig *ib*
East India Company 109
Eau-de-Luce *ib*
Ebony *ib*
Echalotte *ib*
Eclectics *ib*
Eclipse *ib*
Ecliptic 110
Economy *ib*
Eddoes *ib*
Education *ib*
Eel *ib*
Effervescence 111
Effluvium *ib*
Egg *ib*
Elasticity 112
Elder *ib*
Elecampane 113
Electricity *ib*
Electuary 115
Elephant *ib*
Elixir 116
Elk *ib*
Ell *ib*
Elm-tree *ib*
Elocution 117
Elongation *ib*
Eloquence 118
Embalming *ib*
Embargo *ib*
Embossing *ib*
Embroidery *ib*
Emerald *ib*
Emersion 119
Emery *ib*
Emetics 120
Enamel *ib*
Enamelling *ib*
Enchasing 121
Engine *ib*
Engineer *ib*
Engraving *ib*
Enneandria 122
Entomology *ib*
Entry, *Bill of* 124
Epact *ib*
Ephemera *ib*
Epic *ib*
Epidemic 125
PAGE
Epilepsy 125
Epiphany *ib*
Episcopalians *ib*
Epoch *ib*
Epsom Salt *ib*
Equation *ib*
Equator *ib*
Equilibrium *ib*
Equinox *ib*
Equinoxial 126
Erinaceous *ib*
Ermine *ib*
Eschalot *ib*
Espaliers 127
Essence *ib*
Etching *ib*
Ether 129
Ethics *ib*
Eudiometry *ib*
Euphorbia 130
Evacuation *ib*
Evaporation *ib*
Evening 131
Evergreens *ib*
Exchange *ib*
Excoriation 132
Excrescence *ib*
Excretion *ib*
Executor 133
Exercise *ib*
Exhalation 134
Exocoetus *ib*
Exotic *ib*
Expansion *ib*
Expectorants 135
Explosion *ib*
Extracts *ib*
Extravasation 136
Eye *ib*
F 137
Face *ib*
Face-ach *ib*
Faculty *ib*
Fæcula *ib*
Fagus *ib*
Fainting 138
Fairy Rings *ib*
Falco 139
Falling Star *ib*
Fallowing *ib*
Fan *ib*
Farcy *ib*
Farina 140
Farina Fæcundans *ib*
Farm-Yard *ib*
Farriery 142
Fat *ib*
Fata Morgana *ib*
Feather 143
February *ib*
Feeling *ib*
PAGE
Felis 144
Felo-de-se *ib*
Felony *ib*
Felspar *ib*
Felting 145
Fence *ib*
Fennel 146
Fermentation 147
Fern *ib*
Ferret *ib*
Fescue Grass 148
Fever *ib*
Fibrin 149
Fig-Tree *ib*
Filament 150
Filaria *ib*
Filberds *ib*
File *ib*
Fillagree-work *ib*
Film *ib*
Filtration *ib*
Fining 152
Fir-Tree *ib*
Fire 154
Fire Buckets 156
Fire-Escape *ib*
Fire-Place *ib*
Fire-Proof 159
Fire-Ship *ib*
Firkin *ib*
Fish *ib*
Fishery *ib*
Fishing 163
Fish-Ponds 164
Fistula *ib*
Fits 165
Fixed-Air *ib*
Flageolet *ib*
Flail *ib*
Flambeau *ib*
Flame *ib*
Flannel *ib*
Flatulency 166
Flats *ib*
Flax *ib*
Flax, Toad, 169
Flea *ib*
Flesh *ib*
Flesh-Meat *ib*
Fleuk-Worm 170
Flint *ib*
Float-Boards *ib*
Floor *ib*
Flounder *ib*
Flour *ib*
Flower 171
Flower-de-Luce 173
Flowers 174
Fluates *ib*
Fluid *ib*
Fluids *ib*
Flummery *ib*
PAGE
Fluor Spar 174
Fluoric Acid *ib*
Flute *ib*
Flutes *ib*
Flux *ib*
Fluxion *ib*
Fly *ib*
Fly, Spanish 178
Fly blown *ib*
Flying 179
Flying-fish 180
Fly-struck *ib*
Foal *ib*
Focus *ib*
Fodder *ib*
Fog *ib*
Foil 181
Foliating *ib*
Fomentation *ib*
Food *ib*
Food of Plants 182
Fool's Parsley *ib*
Foot 183
Foot-Halt *ib*
Foot-Rot *ib*
Forage 184
Force *ib*
Forcing *ib*
Forecastle 185
Foremast *ib*
Forestalling *ib*
Forficula *ib*
Forge *ib*
Forgery *ib*
Forging *ib*
Formic Acid 186
Fort *ib*
Fortification *ib*
Fossil *ib*
Fossil Alkali *ib*
Foundered 187
Foundry *ib*
Fount 188
Fountain 189
Fox *ib*
Fox-glove *ib*
Fox-Tail-Grass 190
Fractures *ib*
Fraxinus *ib*
Freckles *ib*
Freehold 191
Free-stone *ib*
Freezing *ib*
Freight *ib*
Fresco *ib*
Fret *ib*
Friction *ib*
Friday 192
Frigate *ib*
Fringilla *ib*
Frit *ib*
Frize *ib*

PAGE
Frizing 192
Frog *ib*
Frost 193
Fruit 194
Fruit-Trees 195
Frumenty 211
Frush *ib*
Fuel *ib*
Fuller's-Earth *ib*
Fulling 212
Fulmination *ib*
Fulminating Powder *ib*
Fumaria *ib*
Fumigation *ib*
Funeral Rites 213
Fungus *ib*
Fur *ib*
Furbisher 214
Furlong *ib*
Furnace *ib*
Furnace, *Air*, 215
Furrow *ib*
Fusion *ib*
Fustic *ib*

G 216
Gad-fly *ib*
Gadus *ib*
Galaxy *ib*
Galbanum *ib*
Gale *ib*
Galega 217
Galenic *ib*
Galenical Medicines *ib*
Gall *ib*
Gall-Bladder *ib*
Galling *ib*
Gallium Tinctorium 218
Gallon *ib*
Gall Stone *ib*
Galvanism *ib*
Gamboge 222
Game 223
Gaming *ib*
Gangrene *ib*
Gannet *ib*
Gaps 224
Garden *ib*
Gar-fish 225
Garget *ib*
Gargil *ib*
Gargle *ib*
Gargut 226
Garlic *ib*
Garnet 228
Garter *ib*
Gas *ib*
Gastric Juice, 229
Gaultheria *ib*
Gauze *ib*

PAGE
Gazette 229
Gelatin *ib*
Generation 230
Genet *ib*
Geneva 231
Gentian *ib*
Genus *ib*
Geography *ib*
Geology *ib*
Geometry 234
Geranium 235
Gestation *ib*
Giant's Causeway 237
Gilding *ib*
Gilead 239
Gin *ib*
Ginger *ib*
Gingerbread 240
Ginger Wine *ib*
Ginseng *ib*
Glaciers *ib*
Glacis *ib*
Gland *ib*
Glanders *ib*
Glass *ib*
Glauber's Salt 243
Glazing *ib*
Globe 244
Glow-worm 245
Glue *ib*
Gluten 247
Gnat *ib*
Gnomon *ib*
Goat *ib*
Goat's-beard 248
Gobelins *ib*
Gold *ib*
Golden Rod 251
Goldfinch *ib*
Gold-Fish 252
Goose *ib*
Gooseberry 253
Goose-foot 256
Gong *ib*
Gordius *ib*
Gossamer *ib*
Gothic Architecture *ib*
Goulard's Extract 257
Gourd *ib*
Gout *ib*
Gracula 259
Grafting *ib*
Grain 262
Grains *ib*
Gramme *ib*
Granite *ib*
Granulation *ib*
Grapes 263
Grass *ib*
Grass-hoppers 278

PAGE
Grates 278
Gravel *ib*
Gravelling 279
Gravelly Lands *ib*
Grease *ib*
Green *ib*
Green-finch 280
Green-House *ib*
Green-Sickness 282
Gregorian Year *ib*
Grey-Hound *ib*
Grief *ib*
Gripes 283
Gritstone 284
Grotto *ib*
Ground-Ivy *ib*
Ground Nuts *ib*
Ground-Pine 285
Groundsel *ib*
Grouse *ib*
Grub 286
Gryllus *ib*
Guaiacum 287
Guava *ib*
Gudgeon *ib*
Guelder-Rose *ib*
Guilandia 288
Guinea *ib*
Guinea-Fowl *ib*
Guinea-Grass *ib*
Guinea-Hen 289
Guinea-Pig *ib*
Gull *ib*
Gullet *ib*
Gum 290
Gum-Boil 291
Gums *ib*
Gun 292
Gunny-Bags *ib*
Gunpowder *ib*
Gutta Serena 293
Gymnastics 294
Gymnosophists *ib*
Gymnotus *ib*
Gypsies *ib*
Gypsum *ib*
Gyrinus 296

H 297
Habeas-Corpus *ib*
Haddock *ib*
Hail *ib*
Hair *ib*
Hair-Grass 298
Hair-Powder *ib*
Halo *ib*
Halting *ib*
Ham 299
Hamamelis *ib*
Hamster *ib*
Hare 300
Harp 301
Harrow *ib*

PAGE
Hart's-horn 303
Hat 304
Hatching 305
Hawk *ib*
Hawk-moth 306
Hawkweed *ib*
Hawthorn *ib*
Hay 307
Hazel-nutTree308
Head-ach *ib*
Hearing *ib*
Heart *ib*
Heart-burn 309
Heart's ease *ib*
Heat *ib*
Hedge 310
Hedge-hog 312
Helianthus *ib*
Hellebore *ib*
Herminthology 313
Hemisphere *ib*
Hemlock *ib*
Hemp 314
Hen 315
Hen-bane 316
Hen-harrier *ib*
Hepatic Aloe *ib*
Hep-tree *ib*
Herb *ib*
Herbal *ib*
Herb-Paris 317
Herb-Robert 318
Heron *ib*
Herring *ib*
Hessian Fly 320
Hiccough *ib*
Hickory *ib*
Hide *ib*
Hide-bound 321
Hippopotamus *ib*
Hirundo *ib*
History 322
Hives 323
Hoarseness *ib*
Hoe 324
Hoeing 326
Hog *ib*
Hogshead 329
Holibut *ib*
Holly *ib*
Hollyhock 330
Hone *ib*
Honey *ib*
Honey-comb 331
Honey-Dew *ib*
Honey Suckle *ib*
Honey-Suckle, the Dwarf 332
Hoof *ib*
Hoof-Boney *ib*
Hoof-bound *ib*
Hoof-brittle 336

PAGE
Hoof-casting 333
Hop ib
Hop Trefoil 336
Horary ib
Horehound ib
Horizon 337
Horn ib
Horn-beam 338
Horn-Distemper ib
Horned Poppy ib
Hornet ib
Horology 339
Horse ib
Horse-Chesnut 347
Horse-Fly ib
Horse-Medicines ib
Horse-Radish 350
Horse-tail ib
Horse-worm ib
Hospital ib
Hot-beds ib
Hot-house 351
Hound 352
Hound's-Berry 353
Hound's-Tongue ib
Hour ib
Hour-glass ib
House ib
House-leek 358
Hoven ib
Hunger ib
Hunting ib
Hurricane ib
Husbandry 359
Hyacinth 360
Hydatids ib
Hydra ib
Hydrargyrum ib
Hydrastis Canadensis ib
Hydraulics ib
Hydrocephalus 361
Hydrogen ib
Hydrography 363
Hydrometer ib
Hydrophane ib
Hydrophobia ib
Hydroscope ib
Hydrostatics ib
Hygrometer 364
Hygroscope 365
Hypericum ib
Hypochondriac Affection ib
Hyrax ib
Hyssop ib
Hysterics 366
Hystrix ib

I J 367
Jack ib

PAGE
Jack-by-the-Hedge 368
Jack-daw ib
Jalap ib
James' Powder ib
Japanning ib
Jasmine 369
Jaundice ib
Jaw 370
Jay 371
Ice ib
Ice-Boat 372
Ice-cream ib
Ice-house ib
Ichneumon 375
Ichthyology ib
Icosandria 376
Jelly ib
Jet ib
Ignition ib
Ilex ib
Iliac Passion ib
Illicium 377
Illuminating ib
Image ib
Immersion ib
Impatiens ib
Implements ib
Impressions ib
Inarching 378
Inclosures ib
Incombustible Cloth ib
Indian Berry 379
India-Rubber ib
Indian Turnip ib
Indigestion ib
Indigo 380
Industry ib
Infancy 381
Infection 382
Inflammation ib
Ingrossing 385
Ink ib
Inn 389
Inoculation ib
Insects 390
Insolation 392
Instinct ib
Instruments, *Mathematical*, 393
Insurance ib
Interest 395
Interfering 398
Interment ib
Intermittent Fever ib
Intestines ib
Intoxication 399
John's Wort ib
Joint ib
Journal ib

PAGE
Joy 400
Ipecacuanha ib
Iris 401
Iron ib
Irrigation 402
Irritability 404
Ischury 405
Isinglass ib
Issues 406
Itch 407
Juice ib
Julep 408
Juniper Tree ib
Ivory 409
Ivory-black ib
Ivy ib

K 410
Kale ib
Kaleidoscope ib
Kalender 411
Kalmia 412
Koolin ib
Kelp ib
Kennel 413
Kermes ib
Kermes-Mineral ib
Key 414
Kidney-vetch ib
Kidnies ib
Kilderkin ib
Killogramme ib
Kiln ib
King-fisher 415
Kino ib
Kitchen ib
Kitchen-Garden 423
Knawell 424
Knee Grass ib
Knee Holly ib
Knife-Board ib
Koumiss ib

L 425
Labdanum ib
Laboratory ib
Labour ib
Laburnum 426
Labyrinth ib
Lac ib
Lace ib
Lacerta 427
Lachrymal gland ib
Lack ib
Lacker ib
Lackey-moth ib
Lacteals ib
Lactic Acid ib
Ladies'-Mantle ib
Ladies'-smock 428
Lake ib

PAGE
Lamb 428
Lamb's-Lettuce 429
Lamb's-Quarters ib
Lameness ib
Lamp 430
Lamp-black ib
Lampas 431
Lamprey ib
Lampyris ib
Land ib
Land-Ditching 433
Language 434
Lanthorn ib
Lapidary ib
Lapwing ib
Larch-Tree 435
Lark 436
Lark-Spur ib
Larva ib
Lath 437
Lathe ib
Latitude ib
Latten ib
Laudanum ib
Laughter 438
Laurel ib
Lavender ib
Lavender-Thrift ib
Law 439
Lawyer ib
Laxatives ib
Layers ib
Layman 440
Lead ib
Lead-wort 443
Leaf ib
Leap Year ib
Lease ib
Leather 445
Leaven 446
Leaves ib
Leech ib
Leek 448
Leg ib
Leguminous Vegetables ib
Lemon-Tree ib
Lenitive Electuary 449
Lens ib
Lentil ib
Leopard's-Bane ib
Lepidoptera ib
Leprosy 450
Lethargy ib
Letter ib
Letter foundry ib
Letter, Sunday, ib
Letter of Attorney ib
Letters-clause ib
Letters of credit ib

PAGE
Letter of license 450
Letter of mart 451
Letters-patent ib
Lettuce ib
Lettuce ib
Level ib
Lever 452
Libelula 453
Library ib
Lientery ib
Life ib
Light 455
Lights, *northern* 457
Lightning ib
Lignum Vitæ 459
Lilac ib
Lily 460
Lily-of-the-Valley ib
Limax 461
Lime ib
Lime-Grass 464
Limes ib
Lime-tree ib
Line ib
Linen 465
Liniment ib
Linnet ib
Linseed ib
Lint 466
Lips ib
Liquid ib
Liquor ib
Liquorice ib
Liriodendron 467
Literary Property ib
Litharge ib
Lithography 468
Lithontriptics 472
Liver ib
Liverwort ib
Lixivium 475
Lizard ib
Loading of Goods ib
Loadstone ib
Loam 476
Lob-Grass ib
Lobster ib
Lock 477
Locked-jaw 478
Locking Pole ib
Locust ib
Logarithms 479
Logic 480
Log-wood ib
Longevity ib
Longitude 481
Lonicera 483
Looking-glass ib
Loom ib
PAGE
Loose-strife 483
Lotion 484
Lottery ib
Lovage ib
Love-Apple ib
Louffer 485
Louse 486
Louse-berry ib
Louse-wort ib
Loxia ib
Lozenge ib
Lucanus 487
Lucerne ib
Lumbago 489
Lunacy ib
Lungs ib
Lungwort 490
Lupine ib
Lustre 491
Lute ib
Lutra ib
Luxation ib
Lytta 492
M 493
Macaroni ib
Mace ib
Machine ib
Mackerel ib
Macropus 494
Maculæ ib
Mad-dog ib
Madder ib
Madness 495
Maggot 498
Magistery ib
Magnesia ib
Magnet 499
Magnetism ib
Magnolia 501
Magpie ib
Mahogany ib
Maiden-Hair 502
Maize ib
Malic Acid ib
Mallow ib
Mallow, the Marsh 503
Malt ib
Mammalia ib
Man 504
Manage 505
Mandrake ib
Manganese ib
Mange ib
Mangel-Wurzel 507
Mangle ib
Mango Tree ib
Manna ib
Man-slaughter 508
Manufacture ib
Manure ib
PAGE
Manuscript 518
Maple-Tree ib
Maranta 519
Marble ib
Marbling 520
Marcasite 521
March ib
Mare ib
Mare's-Tail 522
Marine Acid ib
Marjoram ib
Market ib
Marle ib
Marl-grass 523
Marriage ib
Marrow 524
Mars ib
Marsh ib
Marsh-Locks 525
Marsh-Mallow ib
Marsh-Marygold ib
Martin ib
Marygold 526
Marygold, the Corn ib
Masagan Bean ib
Mash ib
Massicot ib
Mastic ib
Mastiff 527
Matching ib
Matweed ib
May ib
May-weed 528
Maze ib
Mazzards ib
Mead ib
Meadow 529
Meadow-grass 530
Meadow-Saffron 531
Meadow-sweet 532
Mealy Tree ib
Measles ib
Measure 533
Meat 534
Mechanics 535
Medal 536
Medallion 537
Medeola ib
Medicine ib
Medick ib
Medlar Tree 538
Meerschaum ib
Melancholy ib
Melanthium 539
Meleagris ib
Melia ib
Melic-grass 540
Melilot ib
Melon ib
Membrane 541
PAGE
Memorandum 541
Memory 542
Menstruum 546
Mensuration 547
Mephitic 548
Mercator's chart ib
Mercury 549
Meridian 550
Merops 553
Mesentery ib
Metal ib
Metallic pointed substances 555
Metallurgy ib
Meteor ib
Meteorology ib
Mezereon ib
Mezzotinto 556
Mica ib
Micrometer ib
Microscope ib
Midwifery 557
Mildew ib
Mile 558
Milfoil ib
Miliary Fever ib
Milk 559
Milk-house 561
Milk Thistle 565
Milk-Vetch ib
Milk-weed ib
Milk-wort ib
Mill ib
Mill-reck 567
Mill-stone ib
Millet 568
Mimosa ib
Mineral Kingdom 569
Mineral Waters 572
Mint ib
Misseltoe 573
Mite ib
Mohair ib
Molasses ib
Mole 574
Mole-Cricket 575
Mole Plough ib
Mollusca ib
Molten-grease ib
Molybdena ib
Momentum 576
Momordica ib
Money ib
Moon ib
Moor 577
Mordants 578
Morocco Leather ib
Morse 579
Mortar 580
Mortgage 582
Mortification ib

PAGE
Moschatel 582
Moss ib
Moss-Land 584
Moth ib
Mother of Pearl 585
Motherwort ib
Motion ib
Mould ib
Mountain 586
Mouse ib
Mouth 587
Mowing ib
Mowing Machine 588
Mud ib
Mugwort ib
Mulberry-tree 589
Mule 590
Mullein 591
Mullet ib
Mum 592
Mummy ib
Mumps ib
PAGE
Mundic 592
Muriates 593
Muriatic Acid ib
Murrain ib
Muscle ib
Mushroom 595
Music 597
Musk ib
Musquitoe 598
Mustard ib
Mutton 599
Myrrh ib
Myrica 600
Myrtle ib
N 602
Nails ib
Nail & Bolt-drawer ib
Nailwort 603
Naphtha ib
Narcotics ib
Natron ib
Natural History ib
PAGE
Nature 604
Navigation 605
Nausea ib
Nautilus 606
Nealing ib
Nebulæ ib
Neck ib
Nectarine 607
Needle ib
Negus ib
Nereis 608
Nerve ib
Nettle ib
Nettle-Hemp 609
Nettle-Rash ib
Neutral Salts 610
Neutralization ib
Newspapers ib
New-Style ib
Nickel ib
Nictitating membrane ib
Nightingale ib
Night-mare 611
PAGE
Nightshade 611
Nipple 612
Nipple-wort ib
Nitrates ib
Nitre 613
Nitric Acid ib
Nits ib
Nodes ib
Nonsuch ib
Nose ib
Nostoch ib
Nostrils ib
Nostrum 614
Notonecta ib
Novel ib
Nourishment 615
Nurse ib
Nursery 616
Nut-galls 617
Nutmegs ib
Nux Vomica 618
Nyctalopia ib
Nymph ib

THE

DOMESTIC ENCYCLOPEDIA.

D, the fourth letter in the alphabet, is a kind of middle sound between the *t* and *th*, its sound is formed by a stronger impulse of the tongue to the upper part of the mouth, than is necessary in the pronunciation of the *t*. It is called a lingual letter because the tongue has the principal share in the pronunciation of it. D denotes as a numeral, 500, and with a dash over it, D̄ is 5000: as an abbreviation it stands for Doctor, as D. D. doctor of Divinity, &c. D. D. D. are used in dedications for *dat, dicat, dedicat:* and D. D. D. D. for *dignum Deo donum dedit.*

DAB, or *Pleuronectes limanda*, L. a fish that frequents the English seas, where it is caught in considerable numbers. It is in general of an uniform brown colour on the upper side, though sometimes of a darker shade. The scales are small and rough, and the lower part of the body is white. These fish are in season from February to April: they spawn in May and June, and become watery and flabby during the remainder of the summer. They are flat; and though inferior in size to the common plaise, the dab is preferred in point of delicacy and flavour.

DACE, or *Leuciscus cyprinus*, L. a fish found in most of the still deep rivers of England. It seldom exceeds 10 inches in length, or weighs more than a pound and a half.

Dace spawn in the month of February, and are in the highest perfection in April and May; but they are at no season a well-tasted fish, or much esteemed. They afford, however, considerable amusement to the expert angler, as they will bite at any fly, but are particularly fond of the stone-caddis, or May-fly, which abounds towards the latter end of April, and the whole of May. After that month, recourse must be had to the ant-fly, the best of which are those black insects found in large ant or mole-hills. In warm weather these fish seldom refuse a fly on the surface of the water; but, at other times, the bait should be immersed to within three inches of the bottom. The winter angling for dace requires a very different bait: this is a white maggot with a red head, being the produce of the eggs of the beetle, and which is turned up by the plough in great abundance. A number of such grubs, if kept in any vessel with the soil in which they were taken, may be preserved for several months, and will prove an excellent bait. Small dace may be put into a glass or jar with fresh water, which should be frequently changed; in this element they live a long time, and gradually become tame.

DAIRY-HOUSE, in rural economy, a place appropriated to the management of milk, butter, cheese, &c. See MILK, BUTTER, CHEESE, CHURN, and COWS.

A dairy ought to be so situated, that the windows, or lattices, may never front the south, south-east, or south-west; and it should at all times be kept in the neatest order. Lattices are also far preferable to glazed lights, as they admit a free circulation of the air. It has, however, been objected that the former affords access to the cold air of winter, and to the sun in summer: but either may be easily remedied, by making the frame somewhat larger than the lattice, and constructing it so as to slide backward and forward at pleasure. Across this frame, pack-thread may be stretched, and oiled paper pasted on it, which will thus admit the light, and effectually keep out the sun and wind.

During the summer, dairy-houses cannot be kept too cool: they ought therefore, to be erected, if possible, near a cold spring, or running water; and, where it is practicable, to conduct a small stream through the premises, it will much contribute to the convenience and utility of the place. Dr. Anderson observes, in his practical essay on the management of the dairy (published in the 3d and 4th vols. of his ingenious "*Recreations in Agriculture*," &c.) that if the water can be introduced by means of a pipe, so as to fall from some height on the floor, it will be productive of many advantages, particularly by preserving a continual freshness, and purity of the air. Dairy-houses should therefore be neatly paved, either with red brick, or smooth hard stone, and laid with a proper descent, so that no water may stagnate. This pavement should be well washed every day during the summer; and all the utensils, here employed, be kept with unremitting attention to cleanliness. Nor should the churns be at any time scalded in the dairy, as the steam arising from hot water, tends greatly to injure the milk. For similar reasons, neither the cheese and rennet, nor the cheese-press, must be suffered to taint the atmosphere; as the whey and curd will diffuse their acidity over the whole building.

All the utensils of the dairy should be made of wood, in preference to either lead, copper, or cast iron; for these metals are easily soluble in acids; the solutions of the two first are in a high degree poisonous; and, though the latter is in itself harmless, the taste of it renders the productions of the dairy very disagreeable. The cream-dishes, when perfectly clean and cool, ought to be filled with the milk, as soon as it is drawn from the cow, and has been carefully strained through a cloth, or cloth-sieve made of hair or silver-wire: the latter of which, as Dr. Anderson justly remarks, is more wholesome than those of other metals. These dishes should never exceed three inches in depth, but may be so wide as to contain a gallon, or a gallon and a half of milk: when filled, they ought to be placed on shelves, to remain there till the cream be completely separated. Now it is to be taken off with nicety, by a skimming dish, (without lifting or removing the milk, or shedding any of it on the floor, which would soon corrupt the air of the room), and then deposited in a separate vessel, till a proper quantity be collected for churning. A firm, neat, wooden barrel, which is open at one end, and has a lid closely fitted to it, appears to be well calculated for this purpose; a cock, or spigot, ought also to be fixed near the bottom, to draw off the thin, or serous part, that may drain from the cream; and the inner side of the opening should be covered with a piece of fine silver wire-gauze, in order to prevent the latter from escaping, while the former is allowed to pass.

Lastly, all the utensils employed in the dairy, of whatever materials they may consist, should be cleaned with similar care, previously to their being used; and, as long as the least acid smell is perceptible, they ought to undergo repeated scourings, till they are completely sweetened. See Milk-House.

[The wooden utensils should be well washed with water containing a little ley or alkaline ley of wood ashes, to neutralise the acid imbibed by the wood.—T. C.]

DAMASK, a silk stuff, with a raised pattern, so as that the right side of the damask is that which has the flowers raised or satined. It has its name from being originally brought from the city of Damascus in Syria.

Damask, a kind of wrought linen, made in Flanders, and obtaining its name from its large patterns in the manner of Damask.

Damask, is a name also given to a very fine steel brought from Damascus, and used for sword-blades and cutlasses. See Cutlery.

DAMASKEENING, or *damasking*, the art or operation of beautifying iron, steel, &c. by making incisions on those metals, and filling them up with gold and silver wire. This method of ornament is chiefly used for sword blades, guards, and gripes, locks of pistols, &c.

DAMPS, in natural history, noxious steams and exhalations issuing from the earth. These damps are chiefly observed in mines and coal-pits: but vapours of the same descriptions will often escape from old lavas of burning mountains; and in those countries where volcanoes are most common, will enter houses, and kill people suddenly. Four kinds of damps are usually reckoned.

of the approach of the first, or "choke-damp," which is the most ordinary, the workmen are warned by the circular shape assumed by the flame of their candle, which lessens gradually till it expires, and by their own difficulty of breathing. Those who escape swooning, seldom suffer any harm from it: but such as swoon away, though not absolutely suffocated, yet experience on their recovery very violent convulsions. The second kind is the *pease-bloom* damp, so called from its smell. The miners in the peak of Derbyshire fancy it arises from the great number of the red trefoil flowers, which they call honey-suckles, that abound in the limestone meadows of the peak. This damp, they say, always comes in the summer time, but has never been known to be mortal: probably its smell gives timely notice to avoid its effects. The third is the most pestilential, and the most extraordinary of any, if what is said of it be true. Mr. **Jessop**, who describes this and the former, had his accounts from the miners. Those who pretend to have seen it describe it thus: in the highest parts of the roof of those passages, in a mine which branches out from the main grove, they see, suspended, a round thing, about the bigness of a foot-ball, which, when covered with a film of the thickness and colour of a splinter, or any other accident, the damp immediately flies out and suffocates all the company. The miners have a way of breaking it at a distance, by means of a stick and long rope; and when they have done this, they purify the place with fire. They assert that it is formed from the steam of the candles and their own bodies, ascends to the highest part of the vault, and there condenses; and that, in time, a film growing over it, it becomes pestilential. The fourth is the fulminating, or fire damp, which being touched with the flame of a candle, takes fire, and explodes with extreme violence.

DANCE, or *dancing*, as at present practised, may be defined "an agreeable motion of the body, adjusted by art, to the measures or tune of instruments;" but, according to what some reckon more agreeable to the true genius of the art, dancing is "the art of expressing the sentiments of the mind, or the passions, by measured steps or bounds that are made in cadence, by regulated motions of the body, and by graceful gestures; all performed to the sound of musical instruments or of the voice." These definitions apply, properly, to two very different practices; the first is the ordinary dance, the second, the ballet-dance: the one an exercise, the other a performance. As an exercise, or amusement, artificial dancing is nothing more than a methodised act instinctive in the human frame. To teach dancing, is to teach the activity of the body to display itself in a manner regulated by principles of grace, or in imitation of steps and gestures which others have used with approbation. Dancing is a most salutary exercise. By its mechanical effects on the body, it inspires the mind with cheerfulness. The music which accompanies it, has effects upon the body as well as upon the mind. It is addressed through the avenue of the ears to the brain, the common centre of life and motion, whence its oscillations are communicated to every part of the system, imparting to each that equable and uniform vigour and action upon which the healthy state of all the functions depends. By the power of music, many remarkable cures, particularly of those disorders which are much connected with the nervous system, are known to have been performed. Dancing should not be used more than once or twice a week: nor should it even be continued till weariness comes on; nor should the dancer too soon encounter the cold air. If the dance is not performed under cover, motion should not be too suddenly discontinued. Dancing is usually an effect and indication of gaiety; but **Palleprat** assures us, that there are nations in South America, who dance to express sorrow. It has been in use among every people, civil and savage, though held in esteem among some, and in contempt among others. Many examples may be adduced, ancient and modern, of its use in religious ceremonies.

Dance, *Country*, is generally considered of English origin, though now transplanted into almost all the countries of Europe and America; but the name, seeming to imply a rustic way of dancing borrowed from country-people or peasants, is by some others supposed to be a corruption of the French, *contre-danse*, wherein a number of persons placing themselves opposite each other begin a figure. There is no established rule for the composition of tunes to this dance, because there is in music no kind of time whatever which may not be measured by the motions common in dancing.

Dancing, *rope* or *wire*, walking, leaping, dancing, and performing various other feats, to the sound of music, upon a rope or wire, stretched across a stage at the height of five or six feet from the ground. The actions exhibited in this manner are often astonishing, and show, in connexion with others, the extensive and versatile powers of the human frame Every thing in the art depends upon the equilibrium preserved, and a degree of practice that removes all the obstacles of fear. The feet of the performer are chalked, to remedy the inconveniences of a smooth sole, and he is assisted in the preservation of his balance by a long pole. Suetonius, Seneca, and Pliny, mention elephants that were taught to walk on the rope.

DANDELION, the COMMON, or *Leontodon Taraxacum*, L. is an indigenous, perennial plant, growing in meadows and pastures, on road-sides, ditch-banks, &c. It produces yellow flowers, which blow from April to September, and have the remarkable property of expanding early in the morning, and closing in the evening.

In the spring, while the leaves are white, and scarcely unfolded, they are an excellent ingredient in salads. In France, the roots and leaves are eaten with bread and butter. This plant is also relished by goats, and especially by hogs, who devour it eagerly; but sheep and cows dislike it, and horses totally refuse it: the seeds also support the smaller birds, which are extremely fond of them. The root, leaves, and stalk, contain a large proportion of bitter milky juice, which possesses considerable activity.

DATA, among mathematicians, a term used for such things and quantities as are given or known, in order to find other things therefrom, that are unknown. Euclid uses the word for such spaces, lines, and angles, as are of a given magnitude, or to which we can assign others equal.

DATE, the fruit of the *phœnix* or great palm tree.

DAY, according to the most natural and obvious sense of the word, that space of time during which it continues to be light, in contradistinction to night, or the space of time which it is dark: but the period of light being somewhat vague and indeterminate, the time between the rising and the setting of the sun is usually spoken of as the day; and the time that elapses between its setting and its rising again, as the night. The day is divided into hours, and a certain number of days make a week, a month, or a year. The old Latin names for the days of the week are still retained in the journals and proceedings of the British parliament, and also by physicians: these are dies Solis; dies Lunæ; Martis; Mercurii; Jovis; Veneris, and Saturni. The northerly nations have substituted for the Roman gods and goddesses, such of their own as most nearly resembled them in their peculiar attributes: thus the third day of the week, consecrated by the Romans to Mars, was named from the Scandinavian deity Tyr, in the Danish and Swedish language it is Tyrsdag, whence our Tuesday. Tyr was the god of war, among the nations of the north, as Mars was among the Romans. From Odin, or, as it was pronounced, Wodin, we derive Wednesday. Odin answered, according to Tacitus, to the Mercury of the Romans. Thursday is the day of Thor, the most formidable of the northern nations, answering to the dies Jovis of the ancients. The goddess Freya, from whom we derive our Friday, bears a still greater resemblance to Venus. The astronomical day, as we have already observed in the article Chronology, begins at noon, or when the sun's centre is on the meridian, and is reckoned 24 hours to the following noon. The astronomical day or the interval of time between two successive transits of the sun's centre over the meridian, is called likewise a solar day. [Day in scripture is often used for an indefinite period of time; and this seems to be its meaning in the Mosaic account of the creation.—T. C.]

DAYS, *of grace*, in commerce, a customary number of days allowed for the payment of a bill after it becomes due. Three days of grace are allowed in England; ten in France and at Dantzic; eight at Naples; six at Venice, Amsterdam, Rotterdam, and Antwerp; four at Francfort; five at Leipsic; twelve at Hamburgh; six in Portugal; fourteen in Spain; and thirty at Genoa. See EXCHANGE.

DEAD MEN'S EYES, in sea language, a kind of blocks, with many holes in them, but no sheevers, whereby the shrouds are fastened to the chains.

DEAD RECKONING, in naval affairs, the judgment or estimation which is made of a place where a ship is, without any observation of the heavenly bodies, and is performed by keeping an account of her way by the log, in knowing the course which they have steered by the compass, and by rectifying all the allowances for drift, lee-way, &c. according to a ship's known trim. This reckoning is always to be corrected as often as any good observation can be obtained.

DEAFNESS, the state of a person who is deprived of the sense of hearing; it is also used to signify a disease of the ear, which prevents the due perception of sounds.

Deafness is frequently the effect of *old age*, and is incident to most persons in the decline of life. It is, however, sometimes owing to an original defect in the organic structure of the ear; in which case the unhappy individual not only continues deaf, but frequently also speechless. See Dumb.

This complaint may indeed arise from a variety of causes: such as injuries sustained by the ear from wounds, ulcers, excessive noise, violent colds in the head, fevers, hard wax adhering to the cavity of the ear; or, too great a degree of either moisture or dryness in that organ. When it is the effect of old age, or of wounds and ulcers in the ears, it is not easily remedied. If it proceed from a catarrh affecting the head, especially after cold bathing, the patient must be careful to preserve that part constantly warm, particularly during the night: he should likewise take some gentle laxatives, keep his feet warm, and bathe them frequently in tepid or luke-warm water, at bed-time. Mercurial frictions have, in this case, been applied with success. But, if the complaint originate from fevers, it will generally disappear when the patient recovers his health; or if it arise from dry wax clogging the ears, this may be softened, by dropping a little sweet oil, or oil of rosemary, into them; after which they should be syringed with warm milk and water.

If deafness be occasioned by too great a dryness in the ears (which may be easily ascertained by inspecting them), half an ounce of the oil of sweet almonds, and half that quantity of camphorated spirit of wine, may be mixed together, and a few drops poured into the ear every night, previously to going to bed; care being taken to close them afterwards with a little wool, or cotton. When the ears abound with moisture, the superfluous humour may be drained by an issue, or seton, which should be made as near as possible to the part affected.

Various other remedies have been employed for the cure of deafness. We can from experience, recommend a few drops of onion juice on cotton, to be worn in the ear for several weeks, and daily renewed. Dr. Sims judiciously advises deaf persons to expire forcibly, with their mouth and nose closely stopped; a simple but rational expedient, which ought to be frequently repeated, as it has sometimes afforded instant relief.

These various remedies, however, should be judiciously adapted to different states of the disorder; for, though real benefit has occasionally been derived from them, yet they also often fail, and not unfrequently, are productive of injury. The organs of hearing, as well as those of sight, being extremely tender, require the most cautious treatment, and ought not on any account to be tampered with, nor submitted to the experiments of ignorant pretenders. Hence, instead of having recourse to *nostrums*, we recommend those persons who are afflicted with deafness, to *keep the head warm*. From whatever cause the disorder may originate, this will always be found the safest and most proper practice; more real benefit has often been derived from it, in the most obstinate cases, than from any medicines whatever.

A case of deafness that ensued from plunging suddenly into water, was cured by a salivation. *Medical Commentaries*. This complaint frequently proceeds from hardened wax in the ears; the remedy in this case is to syringe the ears repeatedly with warm milk and water. When it proceeds from a violent cold, bleeding with leeches, and blistering behind the ears are highly useful.

Those born deaf are also dumb, as not being able to learn any language, at least in the common way: yet, as the eyes may in some measure serve them for ears, they may understand what is said by the motion of the lips, tongue, hands, and by the general gesture of the speaker, and even accustom themselves to move their own, as they see others do, and by this means learn to express themselves. Thus Amman, a Swiss physician, residing at Amsterdam, effected surprising things of this kind, and reduced his method to a regular art, of which he published an account in the year 1692. Since that period, the names of Wallis and Braidwood have been known in the same pursuit; and the celebrity of the abbé de l'Epée, in France, is the foundation of baron von Kotzebue's impressive play, known in England by the name of *Deaf and Dumb*. We shall transcribe an extract from a work published by Messrs. Cadell and Davies, as explanatory of the method adopted by M. de l'Epée, and which comprehends the leading principles of his scheme.

“It is not by the mere pronunciation of words in any language that we are taught their signification; the words *door*, *window*, &c. in our own, might have been repeated to us hundreds of times in vain: we should never have attached an idea to them, had not the objects designated by these names been shown to us at the same time. A sign of the hand or of the eye has been the sole means by which we learned to unite the idea of these objects with the sounds that struck our ear. Whenever we heard these sounds, the same ideas arose in our minds because we recollected the signs made to us when they were pronounced.

“Exactly similar must be our measures with the deaf and dumb. Their tuition commences with teaching them a manual alphabet, such as boys at school make use of to hold conversation at one end of a form with their companions at the other. The various figures of these letters strike forcibly the eyes of deaf and dumb persons, who no more confound them than we confound the various sounds that strike our ears.

“We next write (I say *we*, because in the operations with my deaf and dumb pupils I frequently have assistance) in large characters with a white crayon upon a black table, these two words *the door*, and we shew them the door. They immediately apply their manual alphabet five or six times to each of the letters composing the word *door*, (they spell it with their fingers) and impress on their memory the number of letters and arrangement of them; this done, they efface the word, and taking the crayon themselves, write it down in characters, no matter whether well or ill formed, afterwards they will write as often as you show them the object.

“It will be the same with respect to every thing else pointed out to them, the name being previously written down, which being first on the table in large characters, may afterwards be inscribed in characters of ordinary size upon different cards, and these being given to them, they amuse themselves in examining one another's proficiency, and ridicule those that blunder. Experience has manifested, that a deaf and dumb person possessing any mental powers, will acquire, by this method, upwards of eighty words in less than three days.

“Take some cards, having suitable inscriptions, and deliver them one by one to your pupil, he will carry his hand successively to every part of his body conformably to the name on the card delivered to him. Mix and shuffle the cards: he will make no mistake, or if you choose him to write down any of these names on the table, you will see him in like manner distinguish with his finger every object whose name is so offered him, and thus clearly prove that he comprehends the meaning of every one.

“By this process the pupil will obtain, in very few days, a knowledge of all the words which express the different parts of our frame, from head to foot, as well as of those that express the various objects which surround us, on being properly pointed out to him as you write their names down on the table, or on cards put into his hands.

“We are not, however, even in this early stage, to confine ourselves to this single species of instruction, amusing as it is to our pupils. The very first or second day we guide their hands to make them write down, or we write down for them ourselves, the present tense of the indicative mood to *carry*. Several deaf and dumb pupils being round a table, I place my new scholars on my right hand. I put the fore finger of my left hand on the word *I*, and we explain it by signs in this manner, showing myself with the fore finger of my right, I give two or three gentle taps on my breast. I then lay my left fore finger on the word *carry*, and taking up a large quarto volume, I carry it under my arm in the skirts of my gown, on my shoulder, on my head, and on my back, walking all the while with the mien of a person bearing a load. None of these motions escape his observation.

“I return to the table; and in order to explain the second person, I lay my left fore finger on the word *thou*, and carrying my right to my pupil's breast, I give him a few gentle taps, making him notice that I look at him and that he is likewise to look at me. I next lay my finger on the word *carriest*, the second person, and having delivered him the quarto volume, I make signs for him to perform what he has just seen me perform: he laughs; takes the volume, and executes his commission extremely well. This method is adapted to the conception of the pupil in his progress through the intricacies of Grammar. The following description of the means of initiating him in a knowledge of the tenses of verbs will convey a sufficient idea of the plan to general readers: the pupil, though deaf and dumb, had like us an idea of the past, the present, and the future, before he was placed under our tuition, and was at no loss for signs to manifest the difference.

"Did he mean to express a present action, he made a sign prompted by nature, which we all make in the same case without being conscious of it, and which consists in appealing to the eyes of the spectators to witness the presence of our operation; but if the action did not take place in his sight, he laid his two hands flat upon the table, beating upon it gently as we are all apt to do on similar occasions, and these are the signs he learns again in our lessons, by which to indicate the present of a verb.

"Did he design to signify that an action is past, he tossed his hand carelessly two or three times over his shoulder: these signs we adopt to characterise the past tenses of a verb.

"And lastly, when it was his intention to announce a future action, he projected his right hand: here again is a sign we give him to represent the future of a verb.

"It is now time to call in art to the assistance of nature.

"Having previously taught him to write out the names of the seven days of the week, one directly under another, we desire him to set them down in that order, and we then put on each side of his writing what follows before and after the same words under different heads.

Present.

To day—Sunday—I arrange nothing.

Imperfect.

Yesterday—Monday—I was arranging my books.

Perfect.

Day before yesterday—Tuesday—I arranged my chamber.

Past Perfect.

Three days ago—Wednesday—I had arranged my closet.

Future.

To-morrow—Thursday—I shall arrange my papers.

Future.

Day after to-morrow—Friday—I shall arrange my drawers.

Future.

Three days hence—Saturday—I shall arrange my cupboards.

"*Yesterday, day before yesterday, three days ago*, are explained by the number of times we have slept since the day of which we speak.

"*To-morrow, day after to-morrow, three days hence*, are explained by the number of times we are to sleep till the day in question arrive.

"We next teach our pupil to lay a restriction upon his motion. To express a thing past he used to throw his arm backwards and forwards towards his shoulder without rule: we tell him he must throw it only once for the imperfect, twice for the perfect, and three times for the past perfect, which in truth is analogous to what it signifies, the past perfect announcing an action longer past than the perfect, and the latter being in the same predicament with regard to the imperfect."

DEAL, fir planks of different thicknesses, brought from the Baltic to Great Britain, and much used in carpentry. Rods of deal expand gradually, or cross the grain, in moist weather, and contract again in dry; and thence have been found to make a useful hydrometer.

DEATH, the cessation of life. The extreme difficulty of defining what state of the animal economy is absolutely indicative of death has occasioned the repetition of many salutary warnings against too hasty burial. The following are enumerated as the most certain signs or symptoms of death, when taken collectively. 1. Cessation of the pulse. 2. Total suppression of breathing. 3. Loss of animal heat. 4. Rigidity and inflexibility of the body and limbs. 5. Relaxation of the lower jaw. 6. Inability of the eye-balls to return to their sockets, when pressed by the finger. 7. Dimness and sinking of the cornea. 8. Foam in the cavity of the mouth. 9. Blue spots of various sizes, and on different parts of the body. 10. A cadaverous smell. 11. Insensibility to all external stimulants. 12. Putrefaction. These symptoms considered individually are far from conclusive, but when all or even the most of them concur at the same time, they afford the most certain criterion of death.

With respect to the supposed corporeal suffering, we should observe, 1. That death is a mere passive extinction of the vital fire, unattended with any exertion of the animal functions, and therefore wholly free from pain. The agonies, so much talked of, and the sufferings incident to sickness or wounds, are the agonies and sufferings of life, not of death; they are the struggles of the body to live, not to die; efforts of the machine to overcome the obstacles by which its functions are impeded. 2. It has often been suggested, and always with truth, that by-standers are much deceived by the appearance of pain in those who suffer it. Only a degree commensurate to the strength of the body can ever be endured;—this boundary passed, the victim, in the moment, swoons, and is relieved; or, by the continuance of an endurable pain, the sensibility of the nerves is destroyed. 3. We all suffer much more in parts of our lives than we can at the time of death. Severe torture may be experienced before death; but the period is that which precedes the dying state. 4. Death itself is either an instantaneous stoppage of life, or a gradual, languid insensible fainting. In the case of drowning, for instance, much is said to be suffered; yet the pain is in the efforts of the body to live, not in its attempts to die, nor in struggles of the soul to separate, as some persons, however strangely, seem to imagine.

Apparent death, is that state in which life is suspended, either because the body is not susceptible of external stimuli, or the interior organs are in a state similar to that of palsy.

Dr. Struve, in his "*Practical Essay on the Art of recovering Suspended Animation*," exhibits the following view of all the

Symptoms of Life: A slight degree of warmth in the region of the heart, accompanied with contractions and dilatations; a vibrating motion of the whole body, especially after being sprinkled with cold water; and a convulsive tension of some muscles.

Doubtful Signs: Rigidity of the limbs, gradual smoothness of the skin, warmth and redness in particular parts of the body, hiccough, contraction and hissing of the nostrils, a tremulous motion of the whole body, mucus issuing from the nose during the artificial inflation of the lungs, a slight convulsive motion of the mouth, and a firm compression of the teeth.

More certain Signs: Gentle throbbing of the heart; pulsation of the temporal arteries; a slight convulsive motion of the inner corner of the eye; vibration of the eye-ball; and almost imperceptible convulsions of the muscles surrounding the neck.

Distinct Signs of Life: A gentle motion of the jaw; gradual redness of the lips and cheeks; contraction of the different muscles in the face; convulsive motions of the toes; sneezing; tremor of the whole body; vomiting; respiration interrupted by coughing, and groaning.

DEATH-WATCH, or *Termes pulsatorium*, L. a small insect that harbours chiefly in old wood. It is produced from a very minute white egg, which is hatched in the month of March.

When these vermin first leave their shells, they are scarcely perceptible, without the aid of a microscope: from this diminutive size, they gradually acquire their perfect state, when they are about 5-16ths of an inch in length, and of a dark brown, spotted colour. They are remarkable for the ticking noise, similar to that of a watch, which is made by the male and female, when wooing each other. This expression of mutual affection was formerly considered, by the superstitious, as a presage of death in the family where it was heard; from which circumstance the insect has received its name.

There are two kinds of death-watches. The first is thus spoken of by Mr. Allen, in the Philosophical Transactions: it is a small beetle, 5-16ths of an inch long, of a dark brown-colour, spotted; having transparent wings under the vagina, or hard case belonging to the beetle tribe, a large cap or helmet on its head, and two antennæ proceeding from beneath the eyes, and doing the office of proboscides. The part that it beats with, is the extreme edge of the face, which Mr. Allen calls the upper-lip, the mouth being protracted by this bony part, and lying underneath, out of view.—This account is confirmed by Dr. Derham, with this exception, that instead of ticking with the upper-lip, he observed the insect to draw back its mouth, and beat with its forehead. This author had two of these death-watches, which he kept alive several months; and one of them he could bring to beat whenever he pleased, by imitating its beating. He concludes from facts and observations which came under his notice that these pulsations are the methods made use of by these creatures to woo one another.

The second kind of death-watch is an insect in appearance quite different from the first: its colour is greyish, and it bears a general resemblance to the louse. The former only beats seven or eight strokes at a time, and quick; the latter will beat some hours together without intermission, and the strokes are more leisurely, and like the beat of a watch. It is very common in all parts of a house in the summer-months; nimble in running to shelter, and shy of being disturbed; yet it beats freely before an observer, and is easily induced to answer a beating, if viewed without causing it molestation. Dr. **Derham** doubts whether it beats on any other substance, but he never heard their noise except in or near paper. Whether this insect changes its shape and becomes another animal or not, he could not say; but he had reason to suspect that it changes into a sort of fly. The folly and weakness of those who consider the noise of this insect as indicative of approaching death in a family, are well displayed by a poet of our own:

——— a wood-worm,
That lies in old wood, like a hare in
her form;
With teeth or with claws, it will bite
or will scratch,
And chambermaids christen this worm
a death-watch:
Becauselike a watch it always cries click:
Then wo be to those in the house who
are sick,
For sure as a gun, they will give up
the ghost,
If the maggot cries click, when it
scratches the post.

DEBENTURE, a term of trade used at the custom-house, for a kind of certificate signed by the officers of the customs, which entitles a merchant exporting goods to the receipt of a bounty or drawback.

DEBILITY, is that feeble state of life in which the vital functions are languidly performed; when the mind loses its cheerfulness and vivacity; when the limbs are tottering with weakness, and the digestive faculty is impaired.

This complaint, which at present is so prevalent, even in the bloom of life, and among those who ought to form the most vigorous and robust part of a nation, may arise from a great variety of causes, of which the following are the principal: 1. Descent from enfeebled parents; 2. Changes in the admixture, and component parts of the surrounding atmosphere; 3. A sedentary and indolent mode of life; 4. Immoderate sleep; or, in a still more hurtful degree, want of the necessary portion of sleep and repose; 5. Too great exertions either of mind or body; 6. The *unnecessary* and *imprudent* use of medicines; lastly, The almost total disuse, and exclusion of gymnastic exercise, and the general introduction of *sedentary games*, the effect of which creates an almost universal apathy to every pursuit that requires exertion.

Debility is the source of numerous disorders, such as spasms, palsy, violent evacuations, hæmorrhages, putrid and nervous fevers, fainting fits, and apparent death.

The means employed for the preserving and maintaining *feeble life* (says Dr. **Struve**, in his *Asthenology;* or, the Art of preserving Feeble Life,) are as various as the causes on which it depends, and the disorders with which it is generally accompanied. The first object that claims the attention of persons in this state, is *warmth;* the external application of which ought to be proportioned to the temperature of the body, and gradually augmented, accordingly as the natural warmth of the individual increases. If duly applied, gentle heat possesses both stimulating and strengthening properties, by which the activity of the vital principle is excited and supported. The communication of warmth may be considerably facilitated by the use of the *tepid* or warm bath, of which we have already spoken. See **Bath**.

The next, and one of the most important objects to debilitated persons, is *diet;* in which respect much depends on their previous habits and modes of life. If they carefully attend to the peculiarities of their constitution, and observe whatever is to them salutary or hurtful, they may prolong their lives for a considerable time; provided their conduct be guided by the necessary knowledge and experience. In short, to guard against excess, and pursue a middle course, will be the best means of accomplishing the most salutary end.

Debilitated persons ought to be imperceptibly hardened; the transition to a severer and more invigorating course of life must be so progressive, that the convalescent be not subjected to any disagreeable restraint; and this method should likewise be continued for a sufficient length of time, during which he ought never to return to his former debilitating habits.

Such invalids should eat only a small proportion of animal food, namely, white meat, which is least stimulating, together with a due quantity of the most nutritious farinaceous vegetables. They may also partake of small portions of flesh-broth, thickened with sufficient bread, rice, &c. to render it more nourishing and less flatulent; but they ought to abstain from fat, and milk, unless the latter be given immediately after it is drawn from the cow; and from acescent vegetables.

If solid food cannot be allowed, or if

it irritate the stomach, recourse must be had to gelatinous aliment, such as eggs, nourishing soups, salop, barley broth, oysters, &c. which, if taken in small quantities, are exceedingly strengthening. Persons of this description ought to accommodate their whole dress to the climate, and changes of the weather; they should at all times endeavour to procure a middle temperature between cold and heat; for instance, from 65° to 72° of FAHRENHEIT'S scale. Woollen clothing is, in this respect, far preferable to fur; as the latter heats the body and increases perspiration. Flannel, if worn next the skin, will preserve the human frame in a more equal temperature than is attainable by any other substance; and at the same time protect it from the hurtful influence of the two extremes.

Individuals, in this state, require longer and less disturbed rest than those in perfect health and vigour. Labour and exercise, adapted to their habits and strength, will greatly promote that desirable object; likewise the tepid bath; a clean, and not too soft couch; an airy, healthy, and capacious apartment; but particularly a calm and composed mind; which last possesses a most powerful influence in preserving health and life; for, without tranquillity, all other means will be ineffectual.

DEBT, *National*, the engagement entered into by a government to repay at a future period, money advanced by individuals for public service, or to pay the lenders an equivalent annuity. The persons who lend the money which government has occasion to borrow generally make a profit of it, but nothing is brought into the country, nor the least addition made to its total wealth by a transaction of this kind; whatever therefore is gained by any individual concerned in it, must be taken from others, and as those who lend the money are persons already in possession of property, and those from whom the sums are requisite for paying the interest, are the public at large, it is evident that all transactions of this nature contribute to increase the existing disparity of the different classes of the community, and consequently that the natural tendency of the funding system is to destroy the intermediate ranks, and divide a nation into two classes only, as unequal in number, as in circumstances, of very rich, and miserably poor. It may, however, be carried to a very great extent, without fully producing this effect, if counteracting circumstances exist sufficiently powerful to dissipate the gains of the rich nearly as fast as they are acquired, and thus prevent a rapid accumulation of wealth. This has been the case of Great Britain, for the increase of expenses has prevented the wealthy from becoming so enormously rich as they otherwise would have been; still they are possessed of more property and larger incomes than the wealthy members of the community at any former period, and the number of poor is considerably augmented.

The great expenses attending the modern system of warfare appears to have created the necessity of national debts, the practice originated in Italy, and was soon adopted in other countries, but it has been brought into a more regular system and carried to a much greater extent in Great Britain than in any other nation. It commenced in the reign of William III. The war which began in 1689 being very expensive, and the grants of parliament not supplying money so fast as it was wanted, the expedient of mortgaging part of the public revenue was adopted. At first the produce of particular taxes was assigned for repayment of the principal and interest of the money borrowed, large sums were slso raised on life annuities, and annuities for terms of years, and the fund established for the payment of these debts, being generally inadequate to the charge upon them, occasioned great deficiences, which at the conclusion of the war amounted to upward of five millions sterling. In 1697 the debt amounted to nearly 20 millions. In 1716 it amounted to 48 millions, which was mentioned in the king's speech as an insupportable burden, and the government thought it necessary to concert such measures as might lay the foundation of an effectual plan for its reduction. In consequence of this disposition all the existing taxes excepting the *land* and *malt*, were made perpetual, and having been distributed into three classes, called the aggregate, south-sea, and general funds, the surplusses remaining after satisfying the previous charges upon these respective funds were formed into a sinking fund, for the express purpose of discharging the principal and interest of such debts and incumbrances as had been previously incurred. See SINKING-FUND. The total amount of the national debt at the commencement of the seven years war in 1756 was 75 millions nearly, and at the end of that war it was increased to upwards of 136 millions. By the American war the debt was increased to 252 millions, which, however, in 1792, previously to the war with France, was reduced to 238 millions: from that period to Midsummer 1807 it was increased to the enormous sum of 756,033,231*l.* 11*s.* $5\frac{1}{4}$*d.*; of which the sum of 117,581,858*l.* was redeemed by the commissioners for paying off the national debt; leaving as the amount of the total unredeemed debt, the sum of 638,451,373*l.* 11*s.* $5\frac{1}{2}$*d.* The interest and expenses of management upon this vast sum amount to more than 22 millions sterling annually, which sum must be raised by taxes independently of those which are called for as the current expenses of government. [At present the national debt of Great Britain (1820), exceeds a thousand millions sterling. The national debt of America is trifling and constantly decreasing.—T. C.]

DECA, "ten," begins many words employed in the English language, as

DECAGON, in geometry, a plain figure with ten sides and ten angles.

DECALOGUE, the ten precepts and commandments delivered by God to Moses, engraved on two tables of stone. The Jews, by way of excellence, call these commandments The Ten Words, whence they afterwards received the name of *decalogue*. This people join the first and second into one, and divide the tenth into two.

DECEMBER, in chronology, the last month of the modern year, consisting of thirty one days, and so called as being the tenth month in the Roman year, which began with March.

DECEMVIRI, ten magistrates, elected by the Roman people, and invested with the power of administering the laws of the twelve tables, which were compiled at the time of their creation. The decemviri were introduced by the popular power to counteract the privileges of the patricians: but their misbehaviour caused the same power to procure their abolishment in the third year of their existence.

DECIDUOUS, an epithet chiefly used in Botany. 1. The calyx or cup of a flower is said to be *deciduous* when it falls, or decays, along with the flower-petals, while on the contrary, it is called permanent when it remains after these are fallen. 2. *Deciduous* leaves are those which fall in autumn, in contradistinction to those of ever-greens. 3. *Deciduous* may be applied to the general part of a shrub or tree when its branches *fall*, as those of some kinds do, in a loose, graceful manner.

DECIMAL ARITHMETIC, the art of computing by decimal fractions. Decimal fraction, a fraction the denominator of which is always 1, with one or more cyphers:—Thus, a unit may be imagined to be equally divided into ten parts, and each of these into ten more; so that by a continual decimal subdivision, the unit may be supposed to be divided into 10, 100, 1000, &c. equal parts, called tenth, hundredth, and thousandth parts of a unit.

In decimal fractions, the figures of the numerator are only expressed, the denominator being omitted, because it is known to be always an unit with so many cyphers as there are places, in the numerator. 2. A decimal fraction is distinguished from an integer with a point prefixed, as .2 for $\frac{2}{10}$, .34 for $\frac{34}{100}$, .567 for $\frac{567}{1000}$, &c. The same is observed in mixed numbers, as 678.9 for $678\frac{9}{10}$, 67.89 for $67\frac{89}{100}$, 6.789 for $6\frac{789}{1000}$, &c. Cyphers at the right hand of a decimal fraction alter not it value; for .5 or .50 or .5000 are all equal to $\frac{5}{10}$ths or $\frac{1}{2}$. But cyphers on the left hand in a decimal decrease the value in a tenfold proportion, for .05 is $\frac{5}{100}$ and $.005=\frac{5}{1000}$. As the denominator of a decimal is always one of the numbers 10, 100, 1000, &c. the inconvenience of writing those denominators down may be saved, by placing a proper distinction before the figures of the numerator only, to distinguish them from integers, for the value of each place of figures will be known in decimals as well as integers, by their distance from the first or unit's place of integers, having similar names at equal distances, as appears by the following scale of places, both in decimals and integers:

&c.	6	6	6	6	6	6	6	·	6	6	6	6	6	6	&c.
	millions	hundreds of thousands	tens of thousands	thousands	hundreds	tens	units		tenths	hundredths	thousandths	ten thousandths	hundred thousandths	millionths	

Decimal fractions are easily reduced into a common denominator, by making, or even supposing, all of them to consist of the same number of places; so .3, .45, .067, .0089, may be written thus .3000, .4500, .0670, .0089: all which consisting of four places, their common denominator is an unit with four cyphers, namely, 10000. Addition and subtraction of decimals are the same as in whole numbers, when the places of the same denomination are set under one another, as in the following examples:

To	35.76	From -	18.45
Add	2.487	Take -	.864
Sum	38.247	Different	17.586

In multiplication the work is the same as in whole numbers; only in the product, separate with a point, so many figures to the right hand as there are fractional places both in the multiplicand and multiplier: then all the figures to the left hand of the point make the whole number, and those on the right a decimal fraction; thus

Ex. 1. Mult.	4.53	Ex. 2.	.342
by	4.6	-	.005
	2718		.001710
	1812		
	20.838		

If there be not so many figures in the product, as ought to be separated by the preceding rule, then, as in example 2, place cyphers at the left to complete the number. In division the work is the same as in whole numbers; only in the quotient, separate with a point, so many figures to the right hand, for a decimal fraction, as there are fractional places in the dividend, more than in the divisor, because there must be so many fractional places in the divisor and quotient together, as there are in the divisor; thus if the sum be

34.3) 780.615 (32.12

after the divisions, as in whole numbers, I find there are 3 decimal places in the dividend and one in the divisor, therefore by the rule there must be two decimals in the quotient. Vulgar fractions are reduced to decimals of the same value, by dividing the numerator by the denominator thus $\frac{1}{2}=\frac{1.0}{2}=.5$, $\frac{3}{4}=\frac{3.00}{4}=75$, and so on.

DECIPHERING, or DECYPHERING, the art, or act of discovering the alphabet of a cypher, or of explaining a letter written in cyphers, or secret characters. See DIPLOMATIC LETTERS.

Every language has peculiar rules of deciphering, which depend not only on the form of its characters, but also on the place, order, frequency, combination, and number of the letters. The importance of this science to politicians has long been acknowledged, and several ingenious philosophers of the 17th century, published profound treatises on this subject; but, as it would be deviating too widely from the avowed plan of this work, to enter into the theory of deciphering, we can only refer the curious, who desire farther information on this head, to the 12th volume of the *Gentleman's Magazine* for 1742, where they will find the art of deciphering deduced from principles, and explained by examples in several languages. It deserves to be remarked, that there is extant, in the library of Oxford, a collection of letters written in cypher, about the time of CHARLES the Second, and decyphered by Dr. WALLIS, the most eminent scholar this country ever produced, in that branch of mystical grammar. Mr. W. WALLIS, a descendant of that learned divine (whose "Life and Sermons" he has lately published,) is in the possession of another volume of *Decyphered Letters*, with their keys in various cyphers and characters; the whole of which contains much information relative to the transactions of those times; as the Doctor held the appointment of decypherer to that suspicious king.

[The following will furnish a key for decyphering.

Words of one letter, *a, i, o.*

Words of two letters, *ah, ha, am, an, as, at, in, is, it, of, oh, on, no, or, do, go, lo, so, to.*

To, is the only two lettered word beginning with *t.*

Three lettered words are 373. Four lettered words innumerable almost.

Begin with, *on, no, to, at, it, did, the, that, have, and, are, which, with, they, these, those, their, them, where, all, shall.*

Words that help are, *good, what, day, sell, well, bell, tell, till, will, indeed, see, eye, ere, soon, though, thought, therefore, people, estate, nevertheless, excuse, examine, exercise, expatiate, excellent, extravagance, experience, noon, soon, follow, sorrow, borrow, morrow, remember, serve, please.*—T. C.]

DECLINATION, the distance of any celestial object from the equinoxial, either north or south: or the perpendicular distance of the said object from the equator. See GLOBES, use of.

DECOCTION, is a very useful way of extracting the soluble and efficacious part of many drugs, particularly of barks, woods, seeds, roots, &c. The three decoctions most used in medicine are those of *Bark*, *Sarsaparilla*, and *Barley*.

DECOMPOSITION, in chemistry, usually signifies the disunion or separation of the constituent parts of bodies. It differs from mere mechanical division, in that when a body is decomposed, the parts into which it is resolved are essentially different from the body itself; but, though a mechanical force is applied to it ever so long, or with ever so much violence, the minutest particles into which the body may be reduced, still retain their original nature.

DECOY, in naval affairs, a stratagem employed by a ship of war to betray a vessel of inferior force into an incautious pursuit, till she has drawn her within the range of her cannon, or what is called within *gun-shot*. It is usually performed by painting the stern and sides in such a manner as to disguise the ship, and represent her either much smaller and of inferior force than she really is, or a friend to the hostile vessel which she endeavours to ensnare. Decoying is also performed to elude the chase of a ship of superior force in a dark night; and this is done by committing to the sea a lighted cask of pitch, which will burn for a considerable time, and misguide the enemy. As soon as the cask is lowered, the ship changes her course, and thus escapes with facility, if at any tolerable distance from the foe.

Decoy, among fowlers, a place for catching wild-fowl, generally contrived where there is a large pond surrounded with wood, and beyond that a marshy and uncultivated country. The means of decoy are a number of ducks, trained to the habit of alluring the wild ones of their species to follow them into such inclosures, that, on the appearance of the decoy-man, they drive, through terror, into a purse net, when they are secured. The general season for catching fowls in decoys, is from the latter end of October to February.

DECREPITATION, in chemistry, a term applied to the crackling noise of salts exposed to heat, by which they are quickly split. It takes place in those salts that have little water of chrystallation, the increased temperature converting that small quantity into vapour, by which the chrystals are suddenly burst. Common salt affords a good example of decrepitation, and when used as a flux should be previously decrepitated.

DEER, comprehends several animals, viz.

The *Elk*, or *Moose Deer*, (*Cervus alces*,) is the largest species of deer that is known, and is distinguished from all others by having broad and flattened horns with several points, no brow-antlers, and a hairy protuberance on the throat.

In size these animals are frequently larger than a horse. The upper lip is square, very broad, deeply furrowed, and hangs over the mouth. The hair of the male is black at the points, dusky in the middle, and white at the roots; that of the female is of sandy brown colour except under the throat, belly, and flank, which are whitish. The males only are horned.

The elk inhabits the forests of North America, of some parts of Europe, and of Asia as far south as Japan.

Strong and powerful as these animals are, it has been found possible to domesticate and train them to labour. Mr. Livingston, at a farm near New York, made the experiment by breaking two elks to the harness. After having been only twice bitted, though two years old, they appeared equally docile with colts of the same age, applying their whole strength to the draught, and proceeding in a steady pace. The motion of these animals is a shambling kind of trot, but it is very rapid, and in drawing carriages they are able to outtravel the horses. They are also less delicate in their food than those animals, are long-lived, and more productive than any known beast of burden, having annually from one to three young ones at a birth. Elks were formerly used in Sweden for the drawing of sledges, but as they were frequently employed in the escape of criminals from justice, the use of them was prohibited under severe penalties.

The inhabitants of all countries where the elk is found esteem its *flesh* a sweet and nutritious food, though the grain is coarser than that of most other kinds of venison. The American Indians assert that they can travel farther after having eaten of it, than of any other animal food. After having been properly salted and dried, the *tongues* are better than those of the ox; and the nose, when cooked, is stated to eat like marrow, and to be one of the greatest delicacies which are produced in Canada. Of the *skins* an excellent buff leather is made, which is strong, light, and soft. This leather is used by the Indians for tent-covers, snow shoes, and the coverings of canoes. The long *hair* of the elk is well adapted for the stuffing of mattresses and saddles.

In Canada the hunting of the wild elk is a frequent, but in general a most laborious pursuit, which chiefly occupies the attention of the Indians during winter, when the whole surrounding country is covered with snow.

In a wild state these animals browse the thick and lofty grasses of the plains, and the leaves and tender branches of trees. During the summer they frequent the banks of rivers and lakes; and in winter they often traverse vast distances upon the frozen snow. Notwithstanding the natural strength of their body their disposition is so mild and inoffensive, that, even when pursued and attacked, they seldom attempt any resistance.

The *Rein-deer*, (*Cervus tarandus*,) is known by its horns being long, bent back, slender, branched, and generally broad at the extremities.

It is about four feet and half high at the shoulder, and is of brown or greyish white colour above, and white on the under parts of the body. Both the sexes are horned.

These animals inhabit several of the alpine districts of America, and the northern countries of Europe and Asia.

Useful and even indispensable as many of the domestic animals of this country are to us, the rein-deer is infinitely more so to the Laplander. For travelling, and the conveyance of heavy burdens in sledges and carriages, he supplies the place of the horse; and such is the speed with which he traverses the frozen snows of that dreary region, that he is able with ease to perform a journey of near a hundred miles in one day. To this labour the animals are trained from the earliest period of their lives; and neither darkness nor storms can essentially impede their progress. The usual mode of travelling is in sledges, to which one or more of the animals are yoked. The sledges are extremely light, somewhat shaped like a boat, having at the back an upright board for the driver to lean against. Being rounded and not flat underneath, much dexterity is requisite in the balancing and management of them. The driver is tied in, and protected by a cover which encloses all the lower parts of his body, and shelters him from the inclemency of the weather. The rein-deer is yoked by a collar, from which a trace is brought under the belly between the legs, and fastened to the fore part of the sledge; and the animal is guided by a cord or rein fastened to its horns, and tied to a hoop held upon the driver's right thumb. He directs the course of the deer by pulling the rein on the side he would have him go, encouraging him at the same time with his voice. In general the Laplanders can travel with ease about thirty miles without stopping.

To persons unaccustomed to the habits of the Laplanders and their animals it will indeed appear wonderful that they should be able to travel during the winter, by night as well as by day, the earth presenting an uniform surface of snow, and not a single vestige of human industry and labour being discernible to direct their course; the snow at the same time flying about in all directions, and almost blinding them. Yet it is certain that they are under no difficulty to find the spot to which they are bound; and, dangerous as these journies may seem, they rarely meet with any accident. When several persons are travelling together, they fix bells to the harness of the animals, in order that the whole may be kept together by hearing when they cannot see each other, after the light of their short day has failed them. To guide them in their course the Laplanders observe in the day time the quarter from whence the wind blows, and at night are directed by the position of the stars. The missionary LEEMS, who resided ten years amongst the Laplanders, remarks that during the whole of that time he did not remember more than one fatal accident to have occurred from this mode of travelling.

As the rein-deer supplies to the Laplanders the place of a horse for conveyance and carriage, so it is an invaluable substitute for the cow in affording them food. The females supply them with *milk*, each yielding about as much as a common she-goat. This, though not so thick as the milk of the cow, is said to be sweeter and more nutritive; and produces to them, by certain processes, both butter and cheese. The mountain Laplander subsists through the whole winter upon these, or upon *flesh* of the rein-deer, slaughtering two or three every week according to the number of his family. The animals are killed by stabbing them in the neck, and the wound is so dexterously inflicted that no *blood* flows from it: but this is found in the inside, whence it is carefully taken out, and enclosed within the paunch, (which is cleansed for this purpose,) and is prepared for use. The *fat* of the rein-deer serves also for food.

Of the *skin*, after it has been properly prepared, the Laplanders make garments, gloves, shoes, and caps, which cover them from head to foot, and protect them against the cold. These skins also serve as interior coverings for tents, as linings and covers for sledges, and as beds. They are more or less valuable according to the season in which the animals have been killed. If slain in the spring the hides are perforated in various parts by a species of insect which lays its eggs in it; but if the deer be killed in winter the skin is free from these defects. The Laplander however, desirous of obtaining the same price for a defective skin as for a perfect one, frequently attempts to defraud the purchaser by artfully closing up the holes in such a manner as to render them scarcely visible.

The *horns* are converted into handles for different kinds of instruments, and an excellent glue is made of them. The *bones* are likewise of use; and the *sinews* or tendons of the legs, after having been held before the fire and beaten with wooden hammers, are divided into filaments as fine as hair, which answer all the purposes of thread; and these filaments twisted together serve for bow-strings and cords of different kinds.

So numerous and important are the uses of the rein-deer in Lapland that there are few inhabitants of that country who do not possess them; and some of the wealthiest have herds consisting of more than 1000 head. In the summer time these feed on divers plants which flourish during that season; but in winter they either browse on the rein-deer liverwort, (*Lichen rangiferinus*) which they dig up from beneath the snow with their feet and horns; or on another kind of liverwort, which hangs on the branches of the fir-trees, and which affords them sustenance when the snows are too deep or too hard frozen to allow them to reach that.

Wild rein-deer live in the mountains and woods, and the hunting of them is in general attended with excessive fatigue; since they are endowed with astonishing muscular powers, and also possess a nicety and acuteness of precaution which can scarcely be equalled. Some idea may be formed of the difficulty of this pursuit, when it is stated that a Laplander in chase of one of these animals has been known to creep on his hands and knees through shrubs and moss, for nearly five miles, before he could come within gun-shot of his prey. The various modes in which rein-deer are pursued are too numerous and too intricate to require a detail in this place. It may be sufficient to say that they are assailed by dogs, traps, pitfalls, snares, cross-bows, and fire-arms, in all the ways which the inventive art of man can devise.

The *Stag*, or *Red Deer*, (*Cervus elaphus*,) is a large species of deer, generally of reddish brown colour on all the upper parts of the body, and white beneath: with large and much branched horns, rounded through their whole length.

The males only are horned.—The male is called *stag* or *hart*, the female *hind*, and the young one has the name of *fawn*.

Red deer are still found in the mountainous parts of Scotland; in the forest of Martindale, Cumberland; in the New Forest, Hampshire; in woods on the river Tamar, in Devonshire; and amongst the mountains of Kerry in Ireland. On the continent of Europe, in several parts of Asia and North America they are very common.

The hunting of these animals was formerly considered one of the most important occupations of the English nobility, and, during the Saxon Heptarchy, it was the privileged pursuit of the sovereign and his court. By the kings of the Norman line laws of the most sanguinary description were enacted for the preservation of these the royal game, it being then deemed less criminal to destroy an individual of the human species than a beast of chase. Forests were enlarged for the shelter of these and other wild animals, and for the more ample enjoyment of the diversion of hunting, at the expense of every principle of justice and humanity. Happily for us the scenes of devastation which this pursuit has occasioned have long ceased to exist; and those vast tracts of country which were once dedicated to hunting are now for the most part applied to the advantages and comfort of man.

As, therefore, the breed of red-deer is now chiefly preserved in this kingdom from motives of curiosity, rather than as either an object of amusement or utility, we are indebted almost wholly to foreign countries for those parts of the stag which are important in a commercial, economical, and medical view. The *skins* are manufactured into an excellently soft, and somewhat yellow-coloured leather, which is useful for numerous purposes. Many very extraordinary medicinal virtues were formerly attributed to the *horns* of the stag, and indeed to nearly all parts of its body; but the experience of late years gives no countenance to them. The horns are of nearly the same nature as bones, and the preparations of them by heat are similar to those from solid animal substances in general. Consequently the articles denominated *spirit of hartshorn* and *salt of hartshorn*, though formerly obtained only from the horns of different species of deer, are now chiefly prepared from bones. The former of these, which is a volatile alkali of very penetrating nature, is an efficacious remedy in nervous complaints and fainting fits: and salt of hartshorn has been successfully prescribed in fevers. The scrapings or raspings of the horns, under the name of *hartshorn shavings*, are variously employed in medicine. Boiled in water the horns of deer give out an emollient jelly which is said to be remarkably nutritive. *Burnt hartshorn* is employed in medicine. The horns of the stag are used by cutlers and other mechanics for the handles of knives and cutting instruments of different kinds. The *flesh* of every species of deer has the name of *venison*; that of the young red-deer is very delicate eating, of the female by no means bad, but that of the full-grown stag has a strong and disagreeable flavour.

These animals generally live in herds that consist of females with their offspring headed by one male, and they inhabit the wildest and most unfrequented parts of forests, browsing on grass, or the leaves and buds of trees. They have a penetrating sight, and an exquisite smell, and are always on guard against the approach of danger. Their disposition when unprovoked is mild and peaceable, but if attacked they prove extremely formidable opponents. The females produce their offspring (generally one each) about the latter end of May, or the beginning of June.

The *Fallow Deer*, (*Cervus dama*,) is a considerably smaller animal than the stag, generally of brownish bay colour on the upper parts of the body and whitish beneath, with branched horns, bent back, compressed and broad at their extremity.

The males only are horned. The male of the fallow deer is called *buck*, the female *doe*, and the young one *fawn*.

Common as these animals are in parks throughout every part of England, they are not found wild in that country. They however inhabit various forests of the continent even as far as south of Persia.

There is no species of food in more general request by epicures and *bonvivans* than the *venison* of the fallow deer, which when properly dressed is an excellent aliment, and easily assimilated to the human fluids; but when eaten half putrid, as is generally the case, it is considered very detrimental to health. The best season for killing the *bucks* for this purpose is from about the first of July to somewhat later than the middle of September: and that for the *does* is from about the middle of November to the middle of February.

The does produce one, sometimes two, and rarely three young ones each, about the beginning of June: these for the first year are called by the park-keepers *fawns*, if during that time they have no horns; the second year, if the young one be a male, it is called a *pricket*; in the third year, a *sorel*, and in the ensuing year a *sore*; when he attains his fifth year he has the name of *buck*, and is accounted fit to be killed; but if he be suffered to live a year or two longer he will improve both in flesh and fatness. If the young one be a female it is called during the first year a *fawn*, during the second a *teg*, and after that it takes its proper name of *doe*. Such does as are intended to be killed in their season are either what have had no fawns in the preceding summer, or have had these killed and taken away.

The *horns* of the fallow deer are used for all the same purposes as those of the stag; and their hides, under the name of *buck-skin* and *doe-skin*, have long been celebrated for their softness and pliability: and the manufacturing of them into breeches and gloves affords subsistence to a very numerous and industrious class of people.

Extensive herds of fallow deer associate together in large parks. These animals are less savage than red deer, yet when offended they often become ferocious. They feed on several kinds of vegetables, and on the leaves, bark, and young branches of trees; many of which, particularly hollies, are cut down by the park-keeper, in the severe weather of winter for their subsistence.

The *Roe*, or *Roe Buck*, (*Cervus capreolus*,) is a small species of deer not more than two feet and a half high at the shoulder, of reddish brown colour, and has short erect horns, divided towards their extremity into two or three points.

The males only have horns.

Small flocks of these animals are found wild in several of the mountainous districts of Scotland, and also in the mountainous woods of Germany, Switzerland, and other parts of the continent of Europe, as well as in those of North America.

In some countries the *venison* of the roe is esteemed, during the proper season, equal to that of any other species of deer. There is, however, a great difference in it, according to the country in which the animals have fed, and the different races or varieties of the animals themselves. The flesh also of the bucks which have passed their second year is said to be tough and not well flavoured, whilst that of the does though of much greater age is more tender. Those animals that are fed in parks, plains, and valleys, are also greatly inferior to such as have resided amongst the mountains.

In America the *skins* of roes are an important object of commerce. They are very light, and are capable for some time of resisting the effects of moisture; of these skins the American Indians make bags or bottles, in which they are able to keep oil, honey, butter, and other similar substances. They are also converted into clothing, and are sometimes dressed as furs, but the hair soon falls off. The *hair* itself is valuable for the stuffing of horse-collars and saddles, and has the advantage of not becoming knotty like that of the ox. The *horns* are used in making handles for knives and for other purposes.

The *Chamois*, (*Antilope rupicapra*,) is a kind of antelope about the size of a goat, with short, erect, round and smooth horns which are hooked backward at the tips.

Its colour is dusky yellowish brown on the upper parts of the body, with the cheeks, chin, throat and belly yellowish white. The horns, which are common to both the sexes, are generally about eight inches in length, but shorter in the female than the male.

These animals inhabit many of the mountainous parts of Europe, particularly the Alps and Pyrenees.

There are few pursuits more arduous and difficult than the hunting of the chamois. Being wholly confined to rocky and mountainous situations, dogs are nearly useless in it; and such are the sagacity and acuteness of perception of these animals, that they take alarm at the most distant approach of danger, and the stratagems which are practised to come within gun shot of them are almost innumerable. They associate in flocks consisting of from four to five or nearly a hundred in number: and when alarmed they are able to spring at a single leap up rocks the perpendicular height of which is more than twenty feet, and in this case by a few bounds they throw themselves entirely out of the reach of their pursuers. If hard pressed they will sometimes turn upon the hunter and attack him with fury, and instances have been related of men thus attacked having been thrown down precipices and destroyed by them.

The chief objects of this pursuit are the *flesh* and the *skin*. The former is in general a nutritious and wholesome food, and the latter is useful in numerous ways. When dressed it forms a soft, warm, and pliable leather which has the name of *shammony*, and is manufactured into breeches, vests, and gloves, that are very durable and serviceable to the labouring classes of the people on the continent. Of late years, however, the art of tanning has been brought to so much perfection, that excellent shammony leather is made from the skins of the goat, the sheep, and the deer. The *horns* of the chamois are often cut into heads for canes, and the farriers of the continent sometimes sharpen and use them for the bleeding of cattle. The *blood* of the chamois is used medicinally, and in Switzerland is a celebrated nostrum for the cure of pleurisy and some other complaints.

The *Common Antelope*, (*Antilope cervicapra*), is a quadruped distinguished by having spiral, round, and expanded horns, each marked with a great number of prominent rings; and the body of a brown colour, clouded with whitish and dusky shades and marks.

It is found in several parts of Africa and India.

A frequent mode of hunting these and some other species of antelope is by the hunting leopard and the ounce. Their *skins* are sometimes dressed with the hair on, and sometimes as leather; and the flesh constitutes a very excellent kind of venison. The horns are convertible to nearly all the same purposes as the horns of the different kinds of deer, and they are occasionally used as weapons.

DEFAMATION, the offence of speaking slanderous words of another; and where any person circulates a report injurious to the credit or character of another, the party injured may bring an action to recover damages proportioned to the injury he has sustained, but he must prove that he has sustained an injury to entitle him to damages; in some cases, however, as for words spoken which by law are in themselves actionable, as calling a tradesman a bankrupt, cheat, &c. there is no occasion to prove any particular damage, but the plaintiff must be particularly attentive to state words precisely as they were spoken, otherwise he will be nonsuited.

DEFINITION, the shewing the meaning of one word by several others which are not synonymous: the special rules for a good definition are these: 1. A definition must be universal, or adequate, that is, it must agree to all the particular species or individuals that are included under the same idea. 2. It must be proper, and peculiar to the thing defined, and agree to that alone.

These two rules being observed, will always render a definition reciprocal with the thing defined: that is, the definition may be used in the place of the thing defined; or they may be mutually affirmed concerning each other. 3. A definition should be clear and plain; and indeed it is a general rule concerning the definition both of names and things, that no word should be used in either of them which has any difficulty in it, unless it has been before defined. 4. A definition should be short, so that it must have no tautology in it, nor any words superfluous. 5. Neither the thing defined, nor a mere synonymous name, should make any part of the definition.

DEFLAGRATION, the act of burning two or more substances together, as charcoal and nitre. When a quantity of nitre (nitrate of potash) is mixed with an equal weight of sulphur or charcoal, and the mixture is thrown into a crucible heated to redness, a vivid combustion is instantly excited. This is deflagration, which is thus explained: nitre is a compound of nitric acid and potash. The nitric acid consists of nitrogen and oxygen, the oxygen is separated by exposure to the red heat, and being suddenly presented to an inflammable body, a vivid combustion is excited, the affinity of the inflammable body to the oxygen of the nitre will cause a decomposition of the substance at even a lower temperature than a red heat. The nitrogen passes off in the state of gas, and the potash with which the acid was united remains united with the body formed by the combination of the oxygen and the inflammable substance.

DEGREE, in Geometry, a division of a circle, including a three hundred and sixtieth part of its circumference: every circle is supposed to be divided into three hundred and sixty parts, called degrees, and each degree divided into sixty other parts, called minutes; each of these minutes being again divided into sixty seconds, and each second into thirds, and each third into fourths, and so on. By this means no more degrees or parts are reckoned in the greatest circle than in the least, and therefore if the same angle at the centre be subtended by two concentrical arches, as many degrees are counted in the one as in the other; for these two arches have the same proportion to their whole peripheries.

DEGREE, in Universities, denotes a quality conferred on the students or members thereof as a testimony of their proficiency in the arts or sciences, and entitling them to certain privileges. The degrees are bachelor, master, and doctor: instead of which last, in some foreign universities, they have licentiates. In each faculty, there are two degrees, bachelor and doctor, which were anciently called bachelor and master. In the arts likewise there are two degrees which still retain the ancient denominations, viz. bachelor, and master.

DEISTS, in the modern sense of the word, are those persons in Christian countries, who, acknowledging all the obligations and duties of natural religion, disbelieve the Christian scheme, or revealed religion. They are so called, in opposition to Christians, from their belief in God alone.

DEITY, a term frequently used in a synonymous sense with God. See God.

DELFT-WARE, a kind of pottery of baked earth covered with an enamel of white glazing which gives it the appearance and neatness of Porcelain, which see.

DELIQUESCENCE, in chemistry, a term applied to certain saline bodies that have become moist or liquid, by means of the water which they absorb from the atmosphere, in consequence of their great attraction to water. When the salt has, by exposure to air, become so far deliquesced as to be in a liquid state, it is said to be in the state of deliquium. Hence alkali reduced by this means to a liquid state, was formerly denominated "oil of tartar per *deliquium*."

DELPHINUS, the dolphin, a genus of fishes, containing several species; among these the porpesse, is the most abundant of the cetaceous animals. Porpesses are gregarious, and are frequently seen frolicking on the water, and playing their uncouth gambols, more especially on the approach of boisterous weather. They feed on smaller fishes, and are themselves very fat, and produce large quantities of oil. They were once considered as a species of luxury at the tables of the great, but are never seen there now. The dolphin is a very large fish, measuring sometimes ten feet in length. It is found both in the Pacific and European seas, and its appearance is in general preliminary to a tempest. It not only pursues and attacks small fish, on which indeed, it subsists, but assails the whale itself, and is stated to have been seen firmly adhering to whales as they have leaped from the water. The ancients appear to have had almost a superstitious attachment to this animal, and relate various anecdotes of it, implying a peculiar susceptibility of gratitude and affection, a strong attachment to mankind, and a rapturous fondness for music.

DELUGE, an inundation covering the earth either in the whole or in part. In history we find accounts of several deluges, as that in the time of DEUCALION, which overflowed Thessaly in the year before Christ 1529. The deluge of OGYGES, which happened 300 years before that of DEUCALION. Of a similar kind were those inundations in the Netherlands which, in 1727, overwhelmed and covered with the sea all that part now called the gulf Dollart in the United Netherlands, and in 1421 all that country situated between Brabant and Holland; but the most memorable deluge is that which by way of eminence is called The universal Deluge or NOAH's Flood, recorded in Scripture as a general inundation sent by God to punish the corruption and wickedness of the world. This flood makes one of the most considerable epochas in chronology. Its history is given by MOSES in the book of Genesis, ch. vi. and vii. and its time is fixed to the year from the creation 1656. From this flood, the state of the world is divided in "diluvian" and "anti-diluvian."

DEMOCRACY, a government, wherein the supreme power is lodged in the hands of the people: such were Rome and Athens of old: in the American republics, the people exercise their sovereignty by means of representatives chosen by themselves. They are therefore representative democracies.

DEMURRAGE, in commerce, an allowance made to the master of a ship by the merchants, for staying in a port longer than the time first appointed for his departure.

DEMURRER, in law, a stop put to any action upon some point of difficulty, which must be determined by the court, before any farther proceedings can be had in the suit. Demurrers are either general without showing any particular cause; or special, where the causes of it are particularly assigned; and one may not pray the judgment of the court on an insufficient declaration or plea, otherwise than by demurrer, when the matter comes judicially before them. In pleadings, if a matter is insufficiently alleged, that the court cannot give judgment thereon, a general demurrer will suffice, and so for want of substance in any plea, &c. but if there be any want of form, it is required that there be a special demurrer.

DENDRITES, or ARBORIZATIONS. This appellation is given to figures of vegetables which are frequently observed in fossil substances. They are of two kinds; the one superficial, the other internal. The first are chiefly found on the surface of stones, between the strata, and in the fissures of those of a calcareous nature

DENOMINATOR, in arithmetic, a term used in speaking of fractions. The denominator of a fraction is the number below the line, showing into how many parts the integer is supposed to be divided. Thus, in the fraction $\frac{3}{4}$, the number 4 shows that the integer is divided into four parts. So in the fraction $\frac{a}{b}$, b is the denominator.

DENSITY, *of Bodies*, is that property directly opposite to rarity, whereby they contain such a quantity of matter under such a bulk.

A body is said to have double and triple the density of another body, when being equal, the quantity of matter is in one double or triple the quantity of matter in the other. The densities and magnitudes of bodies, are the two great points upon which all mechanics and laws of motion turn.

Density, *of the Planets*. In homogeneous, unequal, spherical bodies, the gravities on their surfaces are as the diameters, if the densities are equal. But if the bodies be equal, the gravities will be as the densities. Therefore, in bodies of unequal bulks and densities, the gravity will be in a compound-ratio of the diameters and densities. Consequently, the densities will be as the gravities divided by the diameters, and therefore in the several bodies as follows:

In the Sun.	*Herschel.*	
1.0000.	1.3757.	
Jupiter.	*Saturn.*	*Earth.*
.8601	.4951	.39393.

As it is not likely that these bodies are homogeneal, the densities here determined are not to be supposed the true but rather the mean definities, or such as the bodies would have if they were homogeneal, and of the same mass of matter and magnitude.

[By the experiments of Dr. Maskelyne, Dr. Hutton, Dr. Playfair, and the hon. Mr. Cavendish, the density of the earth compared to water is about 5 to 1, but the density of the crust of the earth is not quite 3 to 1: hence the nucleus is probably near 6 to 1.—T. C.]

Density, *of Air*, it is found by experiment that the density of the air is the greatest at the earth's surface, and that it decreases upwards in geometrical proportion, to the altitudes taken in an arithmetical ratio.

DENTIFRICE, a remedy for the teeth, or a substance used for cleaning them and keeping them in good order: one of the best is said to consist of equal parts of myrrh, charcoal, roach alum and bark, finely pulverised.

DEPHLOGISTICATED, a term applied by Dr. Priestley, and others, to what is now called oxygen gas, when he first discovered it. It was denominated by Scheele, who discovered it about the same period, vital air.

DEPRESSION, of the sun, or a star, in astronomy, is its distance at any time below the horizon, measured by an arc of a vertical circle.

Depression, *of the Pole*. When a person sails or travels towards the equator he is said to depress the pole, because as many degrees as he approaches nearer the equator, so many degrees will the pole be nearer the horizons. This phenomenon arises from the spherical figure of the earth. The altitude or depression of any star is measured by an arc of the vertical intercepted between the horizon and that star.

DERBYSHIRE SPAR, is a mineral formed by the combination of lime with fluoric acid.

It is found in great abundance in the mines of Derbyshire, sometimes occurred in a massive, and sometimes in a chrystallised state; the primitive form of its chrystals being a regular octahedron. Its colour is usually bluish green, yellow, whitish, or a mixture of some of these.

When heated, this substance cracks, and shines brightly in the dark. But if kept hot for some time, it ceases to be luminous, and this property cannot be restored to it. If also two pieces be rubbed strongly together they become luminous.

From this spar are made several kinds of ornamental vases of considerable size, and toys, which, from being extremely varied in their colours and appearance, and admitting of a high polish, are very beautiful.

Its acid is called *fluoric acid*, and has the peculiar property of corroding glass and flint, and consequently cannot be kept in glass bottles. Artists by means of fluoric acid are enabled to etch on glass, in the same manner as with aqua fortis (nitric acid) they do on copper. The process is sufficiently simple. The glass is first a little heated for the purpose of covering it thinly over with wax. Then, with a needle or other fine point the drawing is to be made, by cutting through the wax to the surface of the glass. The edges are next to have a little wall of wax raised upon them. This done, the glass must be placed in an horizontal position, and sifted over with fluor finely pounded; and then a mixture of one part of spirit of vitriol or sulphuric acid with two or three parts of water is to be poured gently upon it. The acid will be prevented from running off by the waxen walls; and in the course of a little while, if these be cleared away, the glass will be found corroded in all the lines along which the needle passed.

The mode of obtaining fluoric acid for chemical purposes is, by pouring sulphuric acid upon powdered spar in a leaden retort, and applying to it a gentle heat. This acid should be used with great caution, since when applied to the skin, it instantly disorganises it, and produces very painful sores.

DERVIS, a name given to all Mahometan monks, though of various orders. Many of the dervises travel over the whole Mahometan world, entertaining the people wherever they come, with agreeable relations of all the curiosities they have met with. There are dervises in Egypt, who live with their families, and exercise their trades, of which kind are the dancing dervises at Damascus. They are distinguished among themselves by the different forms and colours of their habits; those of Persia wear blue; the solitaries and wanderers wear only rags of different colours; others carry on their heads a plume, made of the feathers of a cock; and those of Egypt wear an octagonal badge of a greenish white alabaster at their girdles, and a high stiff cap without any thing round it.

DESERT, a large extent of country, entirely barren, and producing nothing. In this sense, some are sandy deserts, as those of Lop, Xamo, Arabia, and several others, in Asia; in Africa, those of Lybia and Zaara: others are stony, as the desert of Pharan, in Arabia Petrea. "The Desert," absolutely so called, is that part of Arabia south of the Holy-land, where the children of Israel wandered *forty years.*

DESIGN, *in* the manufactories, expresses the figures with which workmen enrich their stuff or silk, and which they copy after some draughtsman, as in diaper, damask, and other flowered silk, tapestry, &c. Every piece being composed of several repetitions of the same design, when the whole design is drawn, the drawer, to re-begin the design afresh, has nothing to do but to raise the little strings, with slip knots, to the top, and this he is to repeat as often as is necessary, till the whole be manufactured.

DETENTS, in clock-work, are those stops, which, by being lifted up or let down, lock or unlock the clock in striking.

DETONATION, in chemistry, an explosion with noise, made by the inflammation of a combustible body. Decrepitation differs from detonation only as producing a fainter noise, or merely a kind of crackling sound peculiar to certain salts. Fulmination is a more quick and lively detonation, such as takes place with certain preparations of gold, silver, mercury, &c.

DEW, is a light, thin, and transparent vapour, slowly exhaling and ascending from the earth, in spring and summer mornings, while the sun is below the horizon, and then deposited on vegetables, in the form of small globules.

[It is deposited on substances in proportion as they are cold from their property of radiating or throwing off heat, with more or less facility. See Dr. WELLS on Dew.—T. C.]

It is further remarkable, that plants continually exhale dew or moisture through the orifices of their vessels, and that this moisture is not a vapour collected by their leaves, as has often been erroneously believed. Each plant exhales this dew, according to the peculiar structure of its organs, and the situation of their orifices. Even shut up in vessels, and covered under glasses, plants have collected a greater quantity of dew during the night, than those standing in the open air. Of this nature, likewise, is the oily or honey-dew, which is sometimes exhaled by trees, as well as herbs, during the summer, and which has been found to settle on the oak, ash, &c.

DEW-BORN, in animal economy, a distemper to which cattle are subject: it is a swelling, or distension of the body, to such a degree that the creatures affected are in danger of bursting. This malady is occasioned by turning them into rank pasture, or feeding them with watery grasses. When they are thus distended, they ought first to be driven, or moved about briskly, and then properly purged and glystered.

DIABETES, a distressing disease, and very difficult of cure. The chief symptom, is a discharge of a very great quantity of limpid sweet urine. The thirst is great, skin parched, tongue white, and moist on its exterior surface, but reddish on the external edges, saliva white, and viscid.

This disease is sometimes attended with fever of the inflammatory kind, in which case the usual remedies will be proper, as small bleedings, and low diet. But in general, it proceeds from a diseased state of the stomach, and of the natural powers of digestion and assimilation. The cure is performed by a regimen, and medicines preventing the formation of sugar, and diminishing the increased action of the stomach. Confinement and entire abstinence, from any species of vegetable matter, a diet solely of animal food, with emetics, *hepatized ammonia*, narcotics, and occasionally the use of sulphur and castor oil, when requisite, comprehend the principal means employed by Dr. ROLLO, the latest writer on the disease.

Dr. RICHTER says, he cured an alarming case, by emetics. Astringents, as alum, and sugar of lead, (2 gr. three times a day) have been used with success in some cases proceeding from general debility.

Diabetes, in farriery, denotes a profuse *staling* of horses : it is generally occasioned by too violent exercise, or by over-straining, &c. When this malady attacks old horses, or those of a weak constitution, it is seldom curable; because they rapidly lose their flesh and appetite, grow feeble, exhibit a staring coat, and ultimately perish. On the contraary, young horses, subject to this disease, may mostly be cured by frequent blood-letting, in small quantities; and the following decoction has often been administered with success. Take of Peruvian bark, 4 oz.; bistort and tormentil-root of each 2 oz.; boil these ingredients in 2 gallons of lime-water, till one half be evaporated: a pint of this liquor should be given three times a day; care being taken not to indulge the horse, either with too much water, or moist food.

This disease in horses may easily be distinguished from others of the kidneys, by attention to the following symptoms ; the surface of the body is cold; the coat rough; loss of appetite; a constant thirst; the animal often craving for water; a frequent and copious discharge from the bladder, which is not truly urinous, but of a pale colour, and an insipid, or sweetish taste; the pulse is weak and quick, attended with a gradual wasting of the flesh. If the disease be of a long standing, it is very difficult to cure. Warm mashes and clothing will be found of great service; to which may be joined the following course of medicine :

Take Peruvian bark in fine powder, 12 oz.; gentian in powder, 3 oz.; honey sufficient to form 16 balls.

One of these balls may be given every morning; and if required, the whole may be repeated. The horse should be gently exercised every day.

DIADELPHIA, in the Linnæan system of botany, a class of plants, the seventeenth in order; comprehending all those with papilionaceous and hermaphrodite flowers, and leguminous seed-vessels. The distinguishing characteristic of this class is, that the stamina adhere together; forming two dissimilar bodies or filaments, the one standing above the pistil and the other surrounding it. This class comprehends pease, beans, vetches, liquorice, and many other genera.

DIAGONAL, in geometry, a right line drawn across a quadrilateral figure from one angle to another, by some called the diameter of the figure. It is demonstrated in geometry, "1. That every diagonal divides a parallelogram into two equal parts. 2. That two diagonals drawn in any parallelogram, divide the figure into two equal parts. 3. That the sum of the squares of the two diagonals of every parallelogram is equal to the sum of the squares of the four sides. 4. In any trapezium, the sum of the squares of the four sides is equal to the sum of the squares of the two diagonals, together with four times the square of the distance between the middle points of the diagonals. 5. In any trapezium, the sum of the squares of the two diagonals is double the sum of the squares of two lines bisecting the two pairs of opposite sides. 6. In a quadrilateral inscribed in a circle, the rectangle of the two diagonals is equal to the sum of the two rectangles under the two pairs of opposite sides.

DIAL, or sun-dial, is a plane, upon which lines are described in such a manner, that the shadow of a wire, or of the upper edge of a plate stile, erected perpendicularly on the plane of the dial, may shew the true time of the day. The edge of the plate by which the time of the day is found, is called the stile of the dial, which must be parallel to the earth's axis; and the line on which the said plate is erected, is called the substile. The angle included between the substile and stile, is called the elevation or height of the stile.

Those dials whose planes are parallel to the plane of the horizon, are called horizontal dials; and those dials whose planes are perpendicular to the plane of the horizon, are called vertical or erect dials.

Those erect dials, whose planes directly front the north or south, are called direct north or south dials; and all other erect dials are called decliners, because their planes are turned away from the north or south.

Those dials whose planes are neither parallel nor perpendicular to the plane of their horizon are called inclining or reclining dials, according as their planes make acute or obtuse angles with the horizon.

The intersection of the plane of the dial, with that of the meridian, passing through the stile, is called the meridian of the dial, or the hour line of XII.

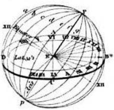
Those meridians, whose planes pass through the stile, and make angles of 15, 30, 45, 60, 75, and 90 degrees, with the meridian of the place (which marks the hour-line of 12) are called hour-circles; and their intersections with

DIALING.

Vol. 2. page 25.

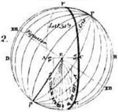
Horizontal Dial

Fig. 1.



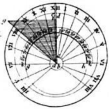
Vertical Dial

Fig. 2.



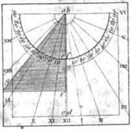
Horizontal Dial

Fig. 3.



Erect South Dial

Fig. 4.



Vol. 2. page 535.

MECHANICS.

Fig. 1.

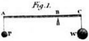


Fig. 2.

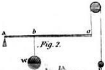


Fig. 3.

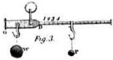


Fig. 4.

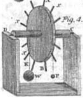


Fig. 8.

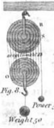


Fig. 7.

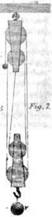


Fig. 5.

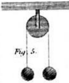


Fig. 6.

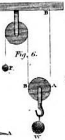


Fig. 9.

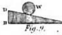


Fig. 10.

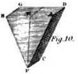
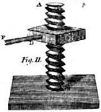


Fig. 11.



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the plane of the dial, are called hour-lines.

In all declining dials, the substile makes an angle with the hour-line of XII; and this angle is called the distance of the substile from the meridian.

The declining plane's difference of longitude, is the angle formed at the intersection of the stile and plane of the dial, by two meridians: one of which passes through the hour-line of XII, and the other through the substile.

We shall now proceed to explain some of the different principles of their construction.

"The universal principle on which dialling depends."—If the whole earth *a* P *p* (Plate Dials, fig. 1,) were transparent and hollow, like a sphere of glass, and had its equator divided into twenty-four equal parts by so many meridian semicircles, *a*, *b*, *c*, *d*, *e*, *f*, *g*, &c. one of which is the geographical meridian of any given place, as London (which is supposed to be at the point *a*); and if the hours of XII were marked at the equator, both upon that meridian and the opposite one, and all the rest of the hours in order on the rest of the meridians, those meridians would be the hour-circles of London: then, if the sphere had an opaque axis, as P E *p*, terminating in the poles P and *p*, the shadow of the axis would fall upon every particular meridian and hour, when the sun came to the plane of the opposite meridian, and would consequently shew the time at London, and at all other places on the meridian of London.

"Horizontal dial."—If this sphere was cut through the middle by a solid plane A B C D, in the rational horizon of London, one half of the axis E P would be above the plane, and the other half below it; and if straight lines were drawn from the centre of the plane, to those points where its circumference is cut by the hour-circles of the sphere, those lines would be the hour-lines of a horizontal dial for London: for the shadow of the axis would fall upon each particular hour-line of the dial, when it fell upon the like hour-circle of the sphere.

"Vertical Dials."—If the plane which cuts the sphere be upright, as A F C G (fig. 2), touching the given place (London) at F, and directly facing the meridian of London, it will then become the plane of an erect direct south dial; and if right lines be drawn from its centre E, to those points of its circumference where the hour-circles of the sphore cut it, these will be the hour-lines of a vertical or direct south dial for London, to which the hours are to be set as in the figure (contrary to those on a horizontal dial): and the lower half E *p* of the axis will cast a shadow on the hour of the day in this dial, at the same time that it would fall upon the like hour-circle of the sphere, if the dial-plane was not in the way.

"To construct a Horizontal Dial by the globe."—Elevate the pole to the latitude of your place, and turn the globe until any particular meridian (suppose the first) comes to the north point of the horizon, and the opposite meridian will cut the horizon in the south. Then set the hour-index to the uppermost XII on its circle; which done, turn the globe westward until fifteen degrees of the equator pass under the brazen meridian, and then the hour-index will be at I (for the sun moves fifteen degrees every hour); and the first meridian will cut the horizon in the number of degrees from the north point that I is distant from XII Turn on until fifteen more degrees of the equator pass under the brazen meridian, and the hour-index will be then at II, and the first meridian will cut the horizon in the number of degrees that II is distant from XII: and so, by making fifteen degrees of the equator pass under the brazen meridian for every hour, the first meridian of the globe will cut the horizon in the distances of all the hours from XII to VI, which is just ninety degrees: and then you need go no farther; for the distances of XI, X, IX, VIII, VII, and VI, in the forenoon, are the same from XII, as the distances of I, II, III, IV, V, and VI, in the afternoon: and these hour lines continued through the centre, will give the opposite hour-lines on the other half of the dial; but no more of these lines need be drawn, than what answer to the sun's continuance above the horizon of your place on the longest day, which may be easily found

Thus, to make an horizontal dial for the latitude of London which is about 51½ degrees north, elevate the north pole of the globe 51½ degrees above the north point of the horizon, and then turn the globe, until the first meridian (which is that of London on the English terrestrial globe) cuts the north point of the horizon, and set the hour-index to XII at noon.

Then, turning the globe westward until the index points successively to I, II, III, IV, V, and VI, in the afternoon; or until 15, 30, 45, 60, 75, and 90 degrees of the equator pass under the brazen meridian, you will find that the first meridian of the globe cuts the horizon in the following numbers of degrees from the north towards the east, viz. $11\frac{2}{3}$, $24\frac{1}{4}$, $38\frac{1}{12}$, $53\frac{1}{2}$, $71\frac{1}{15}$, and 90; which are the respective distances of the above hours from XII upon the plane of the horizon.

To transfer these, and the rest of the hours, to a horizontal plane, draw the parallel right lines *a c* and *b d* (fig. 3) upon that plane, as far from each other as is equal to the intended thickness of the gnomon or stile of the dial, and the space included between them will be the meridian or twelve o'clock line on the dial. Cross this meridian at right angles with the six o'clock line *g h*, and setting one foot of your compasses in the intersection *a*, as a centre, describe the quadrant *g e*, with any convenient radius or opening of the compasses; then setting one foot in the intersection *b* as a centre, with the same radius describe the quadrant *f h*, and divide each quadrant into ninety equal parts or degrees, as in the figure.

Because the hour-lines are less distant from each other about noon, than in any other part of the dial, it is best to have the centres of these quadrants at a little distance from the centre of the dial-plane, on the side opposite to XII, in order to enlarge the hour-distances thereabout under the same angles on the plane. Thus, the centre of the plane is at C, but the centres of the quadrants at *a* and *b*.

Lay a ruler over the point *b*; and keeping it there for the centre of all the afternoon hours in the quadrant *f h*, draw the hour-line of I, through $11\frac{2}{3}$ degrees in the quadrant; the hour-line of II, through $24\frac{1}{4}$ degrees; of III, through $38\frac{1}{12}$ degrees; IV through $53\frac{1}{2}$, and V through $71\frac{1}{15}$: and because the sun rises about four in the morning on the longest days at London, continue the hour-lines of IV and V, in the afternoon, through the centre *b* to the opposite side of the dial. This done, lay the ruler to the centre *a* of the quadrant *e g*, and through the like divisions or degrees of that quadrant, viz. $11\frac{2}{3}$, $24\frac{1}{4}$, $38\frac{1}{12}$, $53\frac{1}{2}$, and $71\frac{1}{15}$, draw the forenoon hour-lines of XI, X, IX, VIII, and VII; and because the sun sets not before eight in the evening on the longest days, continue the hour-lines of VII and VIII in the forenoon, through the centre *a*, to VII and VIII in the afternoon; and all the hour-lines will be finished on this dial; to which the hours may be set, as in the figure.

Lastly, through $51\frac{1}{2}$ degrees of either quadrant, and from its centre, draw the right line *a g* for the hypothenuse or axis of the gnomon *a g i*; and from *g*, let fall the perpendicular *g i*, upon the meridian line *a i*, and there will be a triangle made, whose sides are *a g*, *g i*, and *i a*. If a plate similar to this triangle be made as thick as the distance between the lines *a c* and *b d*, and set upright between them, touching at *a* and *b*, its hypothenuse *a g* will be parallel to the axis of the world, when the dial is truly set, and will cast a shadow on the hour of the day.

The trouble of dividing the two quadrants may be saved, by means of a scale with a line of chords upon it: for if we extend the compasses from 0 to 60 degrees of the line of chords; and with that extent, as a radius, describe the two quadrants upon their respective centres, the above distances may be taken with the compasses upon the line, and set off upon the quadrants.

"To make an erect direct South Dial."—Elevate the pole to the co-latitude of your place, and proceed in all respects as above taught for the horizontal dial, from VI in the morning to VII in the afternoon; only the hours must be reversed, as in figure 4, and the hypothenuse *a g*, of the gnomon *a g f*, must make an angle with the dial-plane equal to the colatitude of the place. As the sun can shine no longer on this dial, than from six in the morning until six in the evening, there is no occasion for having any more than 12 hours upon it. See *Ferguson's Mechanics*.

Dial, *Equinoxial*, is that described on an equinoxial plane, or a plane representing that of the equinoxial. Dials of this kind are usually distinguished into upper, which look towards the zenith, and lower, which respect the nadir. Now as the sun only illumines the upper surface of an equinoxial plane, while he is in our hemisphere, or on the northern side of the equator, an upper equinoxial dial will only shew the hour during the spring and summer season. And again, as the sun only illumines the lower surface of an equinoxial plane, while he is in the southern hemisphere, or on the other side of the equator, a lower equinoxial dial will only shew the hour in autumn and winter. To have an equinoxial dial therefore that shall serve all the year round, the upper and lower must be joined together; that is, it must be drawn on each side of the plane.

DIAMETER, in astronomy. The diameters of the sun and planets are either apparent or real: the apparent diameters are such as they appear to the eye, and being accurately measured by an instrument, are found different in different parts of their orbits. The apparent diameter of the sun is found to vary from 32′ 38″ in January, when it is nearest to us, to 31′ 33″ in July, when it is farthest from us. The apparent diameter of the moon varies from 29′ 28″ to 33′ 36″: her real diameter is about 2180 miles in length. The apparent diameters of the planets when at their respective mean distances from the earth are as follow:

Mercury	11″	Jupiter	39″
Venus	58″	Saturn	18″
Mars	27″	Herschel	3″ 54‴

From these apparent diameters and the respective distances from the earth, the real diameters of the sun and planets have been determined in English miles, which are given in the following numbers.

Mercury	3224	Jupiter	89.170
Venus	7687	Saturn	79.042
Mars	4189	Herschel	35.112

The Sun 883.246.

Diameter, in geometry, a right line passing through the centre of a circle; and terminated at each side by the circumference thereof: the chief properties of the diameter are that it divides the circumference of a circle into two equal parts; hence a method of describing a semi-circle upon any line assuming its middle point for the centre. The diameter is the greatest of chords.

DIAMOND. This is the most valuable and hardest of gems, and though found of different shapes, and sometimes accidentally tinged to several colours, yet it ever carries the same distinguishing characters, and is very evidently in all those states the same body. It is, when pure, perfectly clear and pellucid as the purest water, and is eminently distinguished from all other substances, by its vivid splendor, and the brightness of its reflections. It is extremely various in shape and size, being found in the greatest quantity very small, and the larger ones extremely seldom met with; a very large diamond is in the possession of the Great Mogul, which weighs 297 carats, and is computed to be worth 779,244*l.*

The diamond has certainly one proper and determinate figure, into which it must naturally concrete, when in a state of rest, and impeded by no other accident in its formation: the true figure is an equilateral octahedron; and wherever it has concreted in a perfect manner, and without any interrupting accidents, it has always formed itself into this figure; and often in this its several surfaces are as bright as if polished by art: but, as in common salt, though its figure be pyramidal, yet very trifling accidents can determine it into cubes and parallelopipeds; so the diamond has often, in the state of formation, been thrown into two other figures, both also seeming regular ones; the one a prismatic columnar one of six angles, somewhat emulating the figure of crystal, the other an oblong quadrilateral column with two truncated ends: these seem the only regular figures of this gem; but besides these it is every day found in numberless other mis-shapen forms, often roundish, emulating the shape of pebbles, but full of small flat planes or faces; frequently oblong, very often flat, and as often tapering, either from one end to the other, or else from the middle to both ends. It is common for diamonds to be too thick or deep for the extent of their surface, and there is a certain proportion of depth, beyond which the gem should not be allowed; in this case two diamonds are often made, by the regularly dividing one: this, when the mass is of an angular figure, is done by cutting it through with a wire, wetted with oil, and covered with diamond-powder; but in the flat or more common masses, it is done much more expeditiously by the grain of the stone, and introducing the point of a fine flat chisel between them. This is not the only use of the splitting, for when a diamond has a flaw, or blemish in it, which greatly debases its value, the plates may be separated at a proper breadth, and the flaw removed; in which case the thinner crest, struck off, is of value in proportion to its size, and the remainder, being now freed from its flaw, is of much more value than it was at first. The places whence diamonds are brought are the island of Borneo, and the kingdoms of Nisapour, Golconda, Bengal, in the East-Indies; and the Brazils in South America. They are not unfrequently found yellowish, blueish, and reddish, but more rarely greenish.

In the experiments of modern chemists, the diamond has been reduced to ashes by the power both of the furnace and the burning-glass. In the *Monthly Magazine* for September 1799, an account was given of some interesting experiments by *Guyton*, in Paris, on the combustion of the diamond; whereby it was proved to be a substance similar to charcoal, but containing much more of the pure carbonic principle. This fact has been farther ascertained by the very singular experiment of substituting diamond instead of charcoal, in the conversion of a small portion of malleable iron into steel. For this purpose, a very small crucible of the purest soft or malleable iron was made out of heads of nails, and fitted with a stopper of the same metal, closely fitting. Into this a small diamond was put, the remaining space around the diamond was filled up with filings of the same iron, and the stopper rammed in very close. The whole was then inclosed in an earthen crucible, this last in a larger of the same material, and the whole closely luted, and exposed for about an hour in a very strong forge furnace. When all was cold, the crucible of iron was found melted down into a button of cast steel. This, when broken, exhibited a perfectly smooth, uniform fracture, and not a vestige of the diamond remained. The steel was exactly similar to that known in England by the name of cast steel. The inference from this curious experiment is, that as diamond will perform the office of charcoal, in converting iron into steel, its nature is the same or very similar to that of charcoal. [Diamond or pure charcoal is found usually in alluvial gravel. It has lately been found native in Ireland. Diamonds are chiefly supplied by the East Indies and Brazil.—T. C.]

The most valuable diamonds are those of a complexion similar to that of a drop of water: their price also increases in proportion to the regularity of their form, and accordingly as they are free from spots, stains, flaws, specks, and cross veins. Diamonds are found chiefly in India and South America, whence they are brought to Europe in a rough state, in the form of roundish pebbles with shining surfaces. There is, however, a kind of quartz found in various parts of Europe, and also in the county of Cornwall, where they are called *Cornish diamonds*. These may, with more propriety, be termed crystals; they are found in digging the tin mines of Cornwall, and are, in general, bright and clear, except towards the root, where they are coarse, and assume a whitish colour. [Such stones are found at Bristol, in England; on the shores of Long Island; at Diamond Island, in Lake George; and other places.—T. C.]

It is remarkable that *genuine* diamonds, when exposed to the rays of the sun, attract light, which they again emit, and appear luminous in the dark. The largest jewel of this description in the world, is at present in the royal treasury of Portugal: it is of an oval figure, measures about 4 inches by 3, weighs 1680 carats, or 12½ ounces, and is valued at 224 millions sterling.

Independently of the purposes to which the diamond is subservient as an ornament, especially in the dress of females, the smaller particles of it have, since the 16th century, been employed for cutting glass; and when reduced to an impalpable powder, are very useful for polishing other precious stones, as well as for engraving on those which possess an inferior degree of hardness.

For the valuation of diamonds of all weights, Mr. D. JEFFERIES, an ingenious jeweller, who published a treatise on diamonds and pearls, several years since, lays down the following rule: He first supposes the value of a rough diamond to be settled at 2*l.* per carat, at a medium; then, to find the value of diamonds of greater weight, he directs to multiply the square of their weight by 2, and the product is the value required.

[Diamonds consist of pure charcoal or carbon: in oxygen gas with heat they are dissipated without residuum while the oxygen is converted into carbonic acid gas. Hence they stand at the head of inflammable substances. A glazier's diamond never cuts unless by means of a natural point. The following addition to this article may be acceptable.—T. C.]

The diamond, or adamant of the ancients, which, by universal consent, has been placed at the head of the mineral kingdom, is the hardest of all bodies, and, when pure, is perfectly transparent, like crystal, but infinitely more brilliant.

In a rough, or native state, diamonds have usually either the form of rounded pebbles, with a shining surface, or they are crystallised in the shape of octahedrons, or double four-sided pyramids. Though for the most part colourless, they are sometimes yellow, green, blue, blackish, or rose-coloured.

The best diamonds are brought from the East Indies; and the principal mines are those of Raolconda and Coulour, in the province of Golconda; and that of Soumelpour, or Goual, in Bengal. At Raolconda they are found in the deep crevices of rocks. Persons, by means of long iron rods, with hooks at the ends, draw out from these crevices the loose contents, and afterwards wash them in tubs, for the purpose of discovering the diamonds.

The first discovery of diamonds at Coulour was about two centuries ago, by a countryman, who, on digging his ground to sow millet, accidentally found one of these stones of large size. From that period the whole adjacent plain began to be searched to the depth of from ten to fourteen feet; and the work was at one time so extensively pursued, that nearly 60,000 persons were employed in it. At Soumelpour the diamonds are found amongst the sand and gravel of the river.

Diamonds are likewise obtained from the island of Borneo, and several parts of South America. The mode by which they are discovered in one of the rivers of Brazil has been described by Mr. Mawe. For this purpose the current is turned, and part of the bed of the river being laid dry, the mud is taken up and washed by negroes in places prepared for the purpose, through which a portion only of the stream is allowed to flow.

As soon as all the earthy particles have been washed away, the gravel-like matter that remains is raked together, the stones are thrown out, and what diamonds happen to be present are found amongst the refuse that is left.

In order to ascertain whether a stone which has been found to be really a diamond, the workmen have a mode of placing it upon a hard substance, and striking it with a hammer. If it either resist the blow or separate into leaves, it must be a diamond; but, in the latter case, the discovery is sometimes made at an immense expense, since by thus diminishing the size its value must also, of course, be greatly diminished.

Of all transparent substances, none can be compared for brilliancy to the diamond; and its hardness is such, that no kind of steel instrument can make any impression upon it. Notwithstanding which it has been proved that the diamond is but carbon, or charcoal in a pure and crystallised state. When strongly heated it consumes entirely away.

The ancients, ignorant of the art of cutting diamonds, were contented to set them in a native state; and for this purpose, they preferred such stones as had naturally a crystallised form. The four large diamonds which ornament the clasp of the Imperial mantle of Charlemagne, and which are still preserved in Paris, are uncut stones of this description. The extreme hardness of the diamond baffled all attempts to polish it, in such manner as to exhibit its peculiar beauty, until the year 1456, when a young man of Bruges, whose name was Berquin, endeavoured to polish two diamonds by rubbing them against each other. Having succeeded in this, he next constructed a wheel, on which by means of diamond powder, he was enabled to cut and polish these gems in a manner beyond his greatest expectation. Since this period the art of polishing them has been greatly improved by the Dutch and British jewellers.

Diamonds are generally exported from Madras in a rough state, and in small parcels neatly sewed in muslin, and sealed by the merchants who send them. These, as we are informed by Mr. Milburne, in his valuable work on Oriental commerce, are for the most part sold in Europe by the invoice, as it is called, that is, without being opened, since it is always found that they contain the value for which they were sold in India.

In choosing and valuing diamonds in a rough state, attention is paid to their colour, their being free from extraneous matter, and their shape. Those most perfect are crystalline, and resemble a drop of clear spring water, in the middle of which is to be seen a strong light, that plays with great spirit on moving them about. When they have a yellowish or greenish tinge they are considered to be soft and bad. Many diamonds have a kind of interrupted structure, which lapidaries compare to knots formed in wood. These are rejected, from the impossibility of polishing them properly.

Mr. Mawe remarks that diamonds, when rubbed together, have a peculiarly, and scarcely to be described, grating sound, which is remarkably characteristic of this gem; so that by this circumstance alone rough diamonds may be accurately and expeditiously distinguished from every other gem.

It is usual to cut diamonds into three principal forms, called *brilliant*, *rose* and *table* diamonds. Brilliants are, for the most part, cut from such of the stones as have naturally a crystallised shape, and rose diamonds from the rounded varieties. The former are so called from their great lustre, in consequence of the facets on both sides being cut. These are always set upon a black ground, whilst rose diamonds, which are much thinner, are set upon a white foil speckled with black, for the purpose of adding to their lustre: the black spots being intended to conceal the otherwise tinsel appearance of the foil. They are of course, much less estimable than brilliants, indeed so much so, that of late many rose-cut stones from Holland have been recut into brilliants, notwithstanding the additional expense and the loss of size necessarily attendant on this operation. The table diamond is the least beautiful of any. This mode of cutting is only adopted for such stones or rather fragments, as with a considerable breadth have only a very trifling depth. The diamond cutters of England are considered to be the best in Europe, but their number is so small as to occasion many stones to be sent to Holland, where, from the greater number, and more active competition of the artists, the price of workmanship is considerably lower, but in at least an equal degree inferior to that of London.

The value of diamonds is ascertained by their weight in carats, and this value increases, in a very high ratio, according to their magnitude. For instance, a diamond weighing one carat might be worth about 8*l.* whilst another of 5 carats would be worth 200*l.* of 10 carats 800*l.* and of 20 carats 3,200*l.*

A carat is equal to four jeweller's grains, seven grains of which are equal to six grains troy. To ascertain the value of wrought diamonds the weight must be doubled, about half being supposed to be lost in the working. This sum must be multiplied into itself, and the product by two. Thus, to find the value of a diamond of 20 carats,

$$\begin{array}{r} 20 \\ 2 \\ \hline 40 \\ 40 \\ \hline 1600 \\ 2 \\ \hline 3{,}200l. \end{array}$$

In the possession of the Rajah of Mattan, in the Island of Borneo, is a large diamond, shaped like an egg, with an indented hollow near the smaller end. It was found in that island about 80 years ago, is said to be of the finest water, and weighs 367 carats, or more than two ounces and a quarter. Several years ago the governor of Batavia, desirous of purchasing this gem, sent a Mr. STUVART to the Rajah, authorising him to offer for it 150,000 dollars, two large brigs of war, with their guns and ammunition, together with a certain number of great guns, and a quantity of powder and shot. The rajah, however, refused to deprive his family of so valuable an hereditary possession; the Malays not only attaching to it the miraculous power of curing all diseases by means of the water in which it is dipped, but also believing that the fortune of the family is sustained by its continuing in their possession.

The sceptre of the emperor of Russia is adorned with an oriental diamond about the size of a pigeon's egg, which weighs 195 carats. This is said to have once been placed as the eye of an idol in Seringham, in the Carnatic. A grenadier who had deserted from the French service in India, contrived to become one of the priests of the idol, in the hope of being able to steal this eye, which at length he effected, and escaped with it to Madras, where he sold it to the captain of a ship for a sum equal to 2,500*l.* of British money. It was afterwards transferred to a Jew for 18,000*l.* Coming into the hands of a Greek merchant, he offered it for sale at Amsterdam, in 1766; and the Russian prince Orloff bought it for the Empress Catharine for about 90,000*l.* sterling, and an annuity of 4,000*l.* during the life of the person who sold it.

The *Pitt*, or *regent diamond*, which was set in the handle of the sword of state of Buonaparte, is a brilliant of the most beautiful kind, and weighs 136¾ carats. It was brought from India by George Pitt, Esq. Governor of Bencoolen, in Sumatra, and was sold by him for 130,000*l.* to the Regent Duke of Orleans, who placed it among the crown jewels of France.

The *Pigot diamond* weighs 47½ carats. This, which is an extremely fine stone, was disposed off by lottery, in 1806, for 22,000*l.*

A large star and cross, worn on grand gala days by the Prince of Brazil, as sovereign of the different Portuguese orders of knighthood, are each composed of a great number of magnificent diamonds, set in gold. The centre diamond of the star is alone valued at 800,000*l.* and the whole of the star and cross are said to be worth nearly four millions sterling.

When the diamond is rubbed it will attract bits of straw, feathers, hairs, and other small objects; and if exposed to the rays of the sun, and immediately taken into a dark place, will appear luminous.

DIANA, Tree of. See Silver.

DIANDRIA, in the Linnæan system of Botany, a class of plants comprehending all those with hermaphrodite flowers, and only two stamina in each; such as sage, olive, phillyrea, jessamin, rosemary, &c.

DIAPASON, among the musical instrument makers, a kind of rule or scale whereby they adjust the pipes of their organs, and cut the holes in their flutes, hautboys, &c. in due proportion, for performing the tones, semitones, and concords just.

DIAPHRAGM, in anatomy, a large musculous membrane or skin placed transversely in the trunk, and dividing the thorax from the abdomen.

DIARRHŒA, or **Looseness,** is a frequent and copious evacuation of liquid excrement by stool.

This malady is very common, being either a primary disease, or only a symptom or effect of another. In many cases it is a salutary effort of nature, and therefore should never be stopped, unless it continue too long, or evidently weaken the patient. Infants, adults of tender and delicate constitutions, and those who are of a choleric, or a sanguine habit, are peculiarly liable to this disorder, which may be occasioned by too great a quantity of aliment being taken into the stomach; by the acrid or flatulent nature of the food; by an impaired state of digestion; by various passions of the mind; by diseases of other parts, or of the general system. Many other causes might be enumerated, but these will be sufficient to shew the propriety of not attempting to adopt, in this instance, an *uniform* mode of treatment.

Where looseness is occasioned by excess, or repletion, or from improper food, a gentle emetic may be safely administered, as it will not only cleanse the stomach, but promote all the secretions. The patient ought then chiefly to live on light dishes, and to drink whey, thin gruel, or barley water. If a diarrhœa be the consequence of violent passions, or affections of the mind, it requires to be treated with the utmost caution; mild laxatives with gentle opiates, are proper; particular care ought to be taken to restore cheerfulness, and tranquillity of mind; as, without this, medicines will be of little or no service.

Those persons, who, from peculiar weakness, or too great an irritability of the bowels, are liable to periodical or frequent returns of this disease, ought to live with a constant regard to temperance, and avoid all crude summer fruit, and provision of difficult digestion. They should, likewise, strictly guard against cold, moisture, or whatever may tend to obstruct perspiration; wear flannel next their skin; and take magnesia frequently.

DIARY, a table of days: See Almanack. The subjoined table showing the days of the week that begin the several months for ever, is, to that effect,

A PERPETUAL DIARY.

Months.	*A*	*B*	C	*D*	*E*	*F*	*G*
January	Sunday	Saturday,	Friday,	Thursday,	Wednesd.	Tuesday,	Monday.
February	Wednesd.	Tuesday,	Monday,	Sunday,	Saturday,	Friday,	Thursday,
March	Wednesd.	Tuesday,	Monday,	Sunday,	Saturday,	Friday,	Thursday,
April	Saturday,	Friday,	Thursday,	Wednesd.	Tuesday,	Monday,	Sunday,
May	Monday,	Sunday,	Saturday,	Friday,	Thursday,	Wednesd.	Tuesday,
June	Thursday,	Wednesd.	Tuesday,	Monday,	Sunday,	Saturday,	Friday,
July	Saturday,	Friday,	Thursday,	Wednesd.	Tuesday,	Monday,	Sunday,
August	Tuesday,	Monday,	Sunday,	Saturday,	Friday,	Thursday,	Wednesd.
September	Friday,	Thursday,	Wednesd.	Tuesday,	Monday,	Sunday,	Saturday,
October	Sunday,	Saturday,	Friday,	Thursday,	Wednesd.	Tuesday,	Monday,
November	Wednesd.	Tuesday,	Monday,	Sunday,	Saturday,	Friday,	Thursday
December	Friday,	Thursday,	Wednesd.	Tuesday,	Monday,	Sunday,	Saturday,

This table is very plain; for having the dominical letter for the given year, find that on the head, and guide your eye down from it till you come opposite the month, and there is the name of the day of the week that begins that month. See DOMINICAL LETTER.

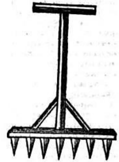
DIASTOLE, signifies the dilatation of the heart, auricles, and arteries, and stands opposed to the systole, or contraction of the same parts.

DIATESSARON, a concord or harmonical interval composed of a greater tone, a less tone, and one greater semitone: its proportion in numbers is 4 : 3. The word diatessaron has of late years been applied by authors for a harmony of the four gospels.

DIBBLE, or DIBBER, a simple but useful implement in gardening, for the purpose of setting out young plants, &c. Within these few years, it has been employed for *dibbling wheat*, and the whole process consists in making perpendicular holes an inch and a half or two inches deep, in the same manner as is usually done in planting potatoe-roots. These holes are made by a man who has a proper staff, shod with iron, in each hand; and, as he walks backwards, is able, by looking at the part of the row already formed, to keep nearly in a straight line, and to make two holes at once, about four inches distant from set to set in the rows. Two or more children attend him, and drop, two, three, or four seeds into every hole, which are afterwards covered by drawing over them what is called a *bush-harrow*.

This method is deservedly considered one of the greatest improvements in agriculture. It appears to have originated from the planting of grain in a garden, from mere curiosity, by persons who neither designed, nor had any opportunity of extending it to a lucrative purpose. Nor was it attempted on a larger scale, till an industrious farmer, in the vicinity of Norwich, began to dibble on less than an acre of land. The success of this experiment induced others to follow this example, and notwithstanding the ridicule they incurred for adopting so singular a practice, their crops were not only larger, but likewise so much superior to those of others, that *dibbling* has become the practice of every intelligent agriculturist in Norfolk, whence it has spread into several other counties.

From a conclusive experiment made by the Rev. H. J. CLOSE, of Trimley, near Ipswich, in the years 1783-4, it appears, that drilling, or dibbling, greatly exceeds the broadcast husbandry, on the best cultivated soils; and, besides the increased produce of grain, many other advantages arise from the former method. For instance, it employs a greater number of labourers, especially women and children that cannot be serviceable in the common mode of culture—[hence it will not answer in America.—T. C.] Mr. CLOSE employed the following frame for setting wheat:



This implement is two feet two inches wide, and provided with seven tines; but Mr. C. has since experienced that a frame of similar width, with *five* tines only, is preferable to one of *seven*.

The lands on which this method may be practised with the greatest advantage, are either those after a clover stubble, or where trefoil and grass-seed were sown in the spring before the last. These, after the usual manuring, are once turned over by the plough in an extended flag or turf, at ten inches wide, and the wheat is set in the manner already described. By this mode, three pecks of grain are sufficient for an acre; which, being immediately buried, is equally secured against the depredations of vermin, or the power of frost. The regular manner in which it rises, affords the best opportunity of keeping it clear from noxious plants, by weeding or hand-hoeing.

Dibbling is peculiarly beneficial when corn is dear; and, if the season be favourable, may be practised with great benefit, both to the public and the farmer: as it saves six pecks of seed-wheat per acre; and, if generally adopted, would of itself afford bread for more than half a million of people. It should, however, be observed, that in seasons when corn is sold at a low price, or the autumn unfavourable to the practice, it cannot be practised with advantage. Thus, in light lands, a very dry season prevents dibbling, because the holes will be filled up as soon as the instrument is withdrawn. In like manner, on strong and stiff clays, if it be very wet, the seeds in the holes cannot be properly covered by the bush-harrow. These two extremes, however, seldom happen; nor do they affect lands of a moderately consistent texture, or both light and heavy soils at the same time; so that they never preclude the general adoption of this useful and rational mode of saving seed-corn.

DICE, certain cubical pieces of bone or ivory marked with dots on each of the faces, from one to six, according to the number of faces. There are divers ways of making dice to suit the purposes of gamblers and villains: as by sticking a hog's bristle in them, so as to make them run high or low:—or by drilling and loading them with quicksilver, which cheat may be discovered by endeavouring to balance them by their diagonal corners, for if they are false, the heavy sides will, under such circumstances, always turn down. Dice are said to be of great antiquity, and to have been invented by PALAMEDES at the siege of Troy, for the amusement of the officers and soldiers.

DIDELPHIS, or OPOSSUM, in natural history, is noticed for the singularity of its structure, which consists in the female's possession of a bag or pouch in the lower part of the abdomen, which is opened and closed at pleasure, and to which her young resort for shelter and security in a variety of dangers. The Virginian opossum is gentle and inoffensive. The female produces four or five at a birth, and prepares a sort of nest for herself of grass, near the root of a tree. She has the power of closing her pouch so completely as to render it a matter of difficulty to open it. The great flying opossum of New-Holland is nearly two feet in length to the beginning of its tail, which is likewise about two feet long. By an expansile membrane reaching on each side of its body, from the fore to the hind legs, it is enabled to leap to an extraordinary distance, and has thus gained its name. Its fur is of the most exquisite fineness, and for the greatest part of a sable, or deep grey, brown colour, extremely brilliant.

DIDUS, or DODO, is a genus of birds of the order Gallinæ, containing three species, of which the *Didus ineptus* may be noticed, it is called the hooded dodo, is a very large bird, and does, or at least did, inhabit the islands of Bourbon and Mauritius. Its pace is very slow, and some individuals are said to weigh 150 lbs. each. Its head appears to be covered with a black cowl, and altogether its figure is singularly curious and grotesque.

DIDYNAMIA, in the Linnæan system of botany, a very comprehensive class of plants, the fourteenth in order; the essential characteristic of which is, that there are four subulated stamina, inserted into the tube of the flower, two whereof are shorter than the others, and placed together; the antheræ being commonly hid under the upper lip of the flower, and connivent in pairs. To this genus belong baum, germander, lavender, thyme, betony, mint, basil, fox-glove, bear's-breech, &c.

DIET, in animal economy, a regimen or course of living, adapted both for the preservation of health, and its recovery, especially from chronical diseases.

The dietetic treatment ought to be conformable to the different constitutions of individuals. Those whose solids are relaxed and weak, should avoid all tough or viscid food, and such as is difficult to be digested. Their nutriment, however, ought to be substantial; and they should take frequent exercise in the open air; hence their food should be stewed rather than boiled or roasted. The plethoric, or those who abound with blood, cannot more effectually consult their health, than by a sparing use of whatever is in a high degree nourishing, as fat meat, rich wines, strong ale, &c. Their aliment, should consist chiefly of bread, or other vegetables, and their drink of water, whey, or small beer. See CORPULENCY.

Persons of a lean habit ought to follow a course directly opposite to that before suggested. Those who are troubled with acidity, (gouty, hysterical and hypochondriacal persons,) should live chiefly on solid meat; should avoid all flatulent food, as also all salted, or smoke-dried provisions, and whatever is difficult of digestion, or apt to turn sour and rancid on the stomach.

Another important object to be considered, is the manner of life and age, together with the season and constitution. Those whose inclination, business, or profession lead them to a sedentary life, ought to be more sparing as to the *quantity*, and more attentive to the *quality* of their aliment, than others whose pursuits are widely different, or who are accustomed to take much exercise; the former ought particularly to avoid the use of every thing that is sour, flatulent, rancid and oppressive to the digestive organs, [such as toast and butter, sour bread, baked fat meats, pie-crust, cheese, &c. —T. C.]

Persons liable to particular diseases, should be cautious in eating whatever tends to aggravate them. The gouty, for instance, should avoid all wines and acids. Those who are subject to the gravel, ought to do the same.

The aliment in early life ought to be light, nourishing, and taken frequently, but in moderation: that of adults should be solid, and sufficiently tenacious; the diet proper for those advanced in life, should resemble that of infancy. At every period of life, gluttony ought to be sedulously avoided; for, not unlike too great abstinence, it destroys the powers of digestion; but the moderate repetition of aliment is necessary for restoring the continual waste of the body. [The digestive process is generally completed in from six to seven hours; so that the intervals of meats should be not more than 6 hours for those who use much exercise, and seven for the sedentary.—T. C.]

Diet ought also to be regulated according to the different seasons of the year; because variations in the atmosphere produce corresponding changes in animal bodies. In consequence of the increased elasticity of the air, in the winter, the fibres are stronger, and better qualified for performing their various functions, and for digesting the stronger kinds of food. If there be no particular reason for the contrary, wine or weak ale, together with warm broths and infusions, may be then taken, to promote the insensible perspiration, which is in some degree checked; as the cold air remarkably contracts the cutaneous pores. Some attention should also be paid to this circumstance, that the perspiration bear a due proportion to the liquid and solid nutriment consumed.

In the spring, the quantity of food ought to be somewhat diminished, and an additional allowance of the liquor usually drunk, might be granted. In autumn, similar regulations are to be observed, as in the spring; because the moisture and density of the air are nearly the same, and the weather is equally variable; so that perspiration is easily obstructed. During the summer, health may be most effectually preserved by vegetables, and diluent liquors. Considerable care should be taken to abstain from provisions that are heavy and difficult to be digested, especially from wine and brandy.

The feeble and convalescent ought to eat frequently, and but little at a time: the number of meals should be proportioned to the weakness of their frame: for it is far less hurtful to a debilitated person, to eat a few mouthfuls every three hours than to make two or three *hearty* meals in one day: an exception, however, ought to be made with respect to those who are naturally of a delicate and irritable constitution.—See FOOD and DRINK.

FAMILY-DIET. After the various and successful experiments made by Count RUMFORD, and others, who have written on domestic economy, little novelty can be expected in this article; but as the present work might be considered as incomplete, without some information on this important subject, we have selected a few practical hints which appear to merit particular attention.

Dr. LETTSOM has observed, ("*Hints designed to promote Beneficence, Temperance, and Medical Science,*") that *pies* are more advantageous than either roasted or boiled meat. This he illustrates by an account of a dinner, where *eight* persons were completely dined off a pye, consisting of 24 oz. of wheaten flour, 64 of mutton, and eaten with 8½ oz. of bread; weighing in the whole 96½ oz. while 60 oz. of mutton *roasted*, and eaten with 33 oz. of bread, weighing in the whole 93 ounces, dined only *five* of the same persons.

Milk pottage for labouring persons is far more wholesome than tea with bread and butter; and, if made after the following manner, is in many respects preferable to milk alone: Let equal quantities of milk and water be boiled up with a little oatmeal, which will break the viscidity of the milk, and be at the same time more easily digested than the latter in an undiluted state. Besides, oatmeal is a much warmer nourishment than wheaten flour, and agrees better with weak stomachs.

Potatoes, if properly boiled, are an excellent and nutritious food. Particular care ought to be taken that they be good, and nearly all of the *same size;* the larger and smaller ones should, therefore, be boiled separately. They must be washed clean, without paring, or scraping, and put into a pot with cold water, but not sufficient to cover them; for their own juice will supply the apparent deficiency. If the roots be of a larger size, as soon as they begin to boil, some *cold* water should be poured in, and occasionally repeated, till they are boiled through to the centre: *otherwise* they will crack and burst on the outside, while the inside will remain half raw. During the time of boiling a little salt should be added, and the slower they are cooked the better will be their flavour. As soon as potatoes are done, the water should be poured off, and the roots re placed over the fire, in order that their moisture may evaporate, and they become dry and mealy; in which state they may be served up, without being previously peeled. This method of boiling or stewing potatoes, is in every respect superior to that of steaming; as by the former process they may be dressed in a shorter time, and will retain no moisture.

Potatoes may be made into puddings, which will both prove an agreeable change of food, and be at the same time uncommonly nutritious. Dr. LETTSOM directs 12 oz. of potatoes, boiled, skimmed, and mashed; one oz. of suet, and an equal quantity of milk and cheese, to be mixed together with boiling water to a due consistence, and baked. An ounce of red-herring may be occasionally substituted for the cheese, and will give the pudding a flavour which is relished by many. See POTATOES.

Barley-broth is an wholesome and nourishing dish; which, as it may be made with almost every kind of garden vegetable, is never out of season. [One pound of barley will give the consistence of pudding to one gallon of water, but it will require five hours boiling; a circumstance worth taking into the calculation.—T. C.] Onions, leeks, and parsley, generally constitute part of the ingredients, to which may be added cabbage, or greens, turnips, carrots, and peas. These are to be mixed with 4 quarts of water, 4 pounds of beef with the bones, 4 oz. of common barley-meal, and stewed together for two hours, when the herbs may be added, being previously cut small, and likewise a small quantity of salt. The whole should then boil till it be tender, and the fat skimmed off or not, at pleasure. Onions or leeks should never be omitted.

There is another article of domestic economy which is usually classed under the name of *Pottage*, for the making of which we have subjoined one or two recipes:

1. Take 3 lbs. of the sticking piece of beef, a part of the skin, or any coarse piece. Boil it in eleven quarts of water for two hours; then add a pound of Scotch barley, and boil it four hours longer, when 6 lbs. of potatoes may be added, and half a pound of onions, together with a small proportion of thyme, pepper, and salt. With these may be mixed other vegetables, and half a pound of bacon cut into small pieces. The whole should be boiled over a slow fire, that it may acquire a proper consistence. It will yield three gallons of excellent and nutritious pottage, and has been found amply sufficient for twenty soldiers, without bread; the nature of the food not requiring any. The expense of this was a few years ago about 2d. per head; but, at the present advanced price of provisions, would at least be double.

2. Take of beef 1 pound, potatoes 2 lbs. barley, one third lb. a similar quantity of onions, together with a small proportion of salt and pepper, and 3 oz. of bacon. The whole expense of these ingredients will be about 18d. Let them be well boiled in a due quantity of water, and they will afford nutriment sufficient to dine and sup three persons without requiring either bread or beer.

[Other *tried* recipes with a view to economy are:

1. Beef stickings 1 lb. Scotch barley 1 lb. potatoes boiled 6 lbs. bacon, chopped small 8 oz. onions 1 lb. pepper and salt, water 12 pints, produce 7 or 8 quarts. Cost 16*d.* sterl. in London.

1. Sheep's head and pluck, or ox cheek, barley 1 lb. potatoes boiled 6 lbs. onions 1 lb. pepper and salt, bacon 4 oz. water 12 pints, produce 7 or 8 quarts. Cost 20*d.* sterl.

2. Shin of beef with the bones, well mashed and broken, bacon 8 oz barley 1½ lb. potatoes boiled 8 lbs. onions 2 lbs. pepper and salt, water 20 pints, produce 12 quarts. Cost 2*s.* 6*d.* sterl.

Any scraps of bread may be added: also a few sweet herbs: the whole to be stewed gently during 2 hours in a close vessel, and only boiled the last half hour.

Admit at your table no new bread, which is equally extravagant and unwholesome; no rolls or muffins; no toast and butter, which is equally so; no buckwheat cakes; no pies and puddings, which demand the finest flour: let your bread be household bread: bake your own bread in winter; buy it in summer. 1 lb. flour will furnish rather more than 1¼ pound of bread, but if, as in summer, you have to make fire on purpose, the saving does not pay.

Remember, all fat and dripping may be made soluble in water, by means of flour. If your flour be not good, add about one ounce of common carbonate of magnesia to 10 lbs. of your flour. This takes away the sourness, makes it rise better, and makes it more wholesome. Half an ounce of pearl-ash would have the same effect, but it hurts the colour of the flour. If you have no magnesia or pearl-ash, you may safely substitute common whiting. All soups should be eaten with small slices of bread toasted hard to promote mastication.—T. C.]

Messes, or pottages like these, are doubtless far preferable to the common dishes, consisting of fat bacon and cabbage, with which a considerable quantity of bread and beer are always consumed. Those who feel an interest in this useful enquiry, we refer to the "*Reports of the Society for increasing the comforts, and bettering the condition of the Poor*," where they will find the subject minutely discussed, and many gross, though common, errors in domestic economy ably exposed.

DIETETICS, the science or philosophy of diets; or that which teaches us to adapt particular foods to particular organs of digestion, or to particular states of the same organ, so that the greatest possible portion of nutriment may be extracted from a given quantity of nutritive matter: or a sufficient portion may be obtained with the least possible quantity of organic action and exhaustion. In this sense the science of dietetics embraces a knowledge as well of the organs and economy of digestion, as of the substances to be digested. The common experience of mankind will sufficiently acquaint any one with the sorts of food which are wholesome to the generality of men, and his own experience will teach him which of these agrees best with his particular constitution. Scarcely any other directions besides these are wanted, except the knowledge that as variety of food at the same meal, and poignant sauces, will tempt most persons to eat more than they can well digest, they ought, therefore, to be avoided by all of weakly habits of body, and by those who are desirous of preserving their health. See DIGESTION.

DIGEST, in law literature, a collection of the decisions of the Roman lawyers properly digested, or arranged under distinct heads, by order of the emperor Justinian.

DIGESTER, an instrument serving to dissolve solid animal substances, in a manner similar to that performed by the stomach. This vessel was invented by PAPIN: after putting meat into it, together with a sufficient quantity of water, a lid is closely screwed on, so as to admit no external air. By a moderate fire, the meat will, in the course of ten minutes, be reduced to a pulp: by augmenting the heat of the fire, or extending the time of digestion, the hardest bones may be converted into a pulp or jelly. This effect is produced by the most perfect closure of the vessel, which prevents the access or escape of air, so that the reverberations occasioned by the expansion of the aërial fluid, dissolve the whole into an uniform body, and mix the aqueous, saline, oleaginous, and other particles so strongly together, that they cannot be easily separated; but, while hot, appear one liquor, and, when cold, form a jelly, of a strength proportionate to the quantity of flesh or bones dissolved in the water.

This useful instrument has not been hitherto applied to culinary purposes; though within the last two years an imperfect imitation of it has been vended in the shops: and we state with satisfaction, that even the latter is incomparably more economical than the various kinds of stew-pans formerly employed. Cast-iron digesters are now manufactured, of various sizes and prices.

DIGESTION, in animal economy, signifies the dissolution of food taken into the stomach, in order to supply the continual loss sustained by perspiration, the different functions, or by exercise.

As soon as the food is taken into the mouth, it is first broken and divided by the teeth, being at the same time moistened with a liquor supplied by the salival glands, and consequently formed into a kind of paste. Thus prepared, it passes into the stomach to digest: a process which is effected, 1. By the salival and gastric juices; 2. By the vital heat of the stomach and viscera of the abdomen; 3. By the remains of food, which adhere to the folds of the stomach, and there become acid and acrimonious; 4. By the agitation arising from the pressure of the abdomen, and the continual pulsation of the contiguous *blood-vessels*; 5. By the liquor which the repeated compression of those muscles causes to be discharged from the glands of the stomach: and, lastly, by air itself, which being mixed with alimentary matter, dilates by the heat of the stomach, and separates the particles of food, which, from the concurrence of these causes, are converted into chyle.

From the stomach, the chyle descends into the intestines, where it incorporates with the blood. These powers, however, are frequently impeded, or weakened, from a variety of causes, too minute to be specified here, but which will be occasionally mentioned in their alphabetical series. See INDIGESTION.

An important distinction exists between animals and vegetables, in the mode in which they receive their nourishment. Vegetables are perpetually absorbing matter from the soil, which immediately passes into the sap-vessels, and is soon changed by respiration and secretion. Animals, on the contrary, with few exceptions, take in food at intervals, and retain it in their stomach for a considerable time, where it undergoes a chemical change, which constitutes the function of digestion, the first step in the general process by which animal matter is formed. See PHYSIOLOGY.

DIGIT, in astronomy, the twelfth part of the diameter of the sun or moon, is used to express the quantity and magnitude of an eclipse. Thus, an eclipse is said to be of six digits, when six of these parts are obscured. Digit is also a measure taken from the breadth of the finger: it is equal to three-fourths of an inch. Digits, in arithmetic, signify any integer under 10, as 1, 2, 3, 4, 5, 6, 7, 8, 9.

DIGITALIS. See FOX-GLOVE.

DIGYNIA, the name of an order, or secondary division in each of the first thirteen classes, except the ninth in Linnæus's system, consisting of plants, which to the classic character, add the circumstance of having two styles or female organs.

DIODON, a genus of fishes consisting of three species, of which the diodon hystrix, or sea porcupine, claims notice. It inhabits the Indian and American seas, and is about two feet in length. It possesses the faculty of raising and depressing its spines at pleasure, and likewise of flattening its body, or changing it to a globular form, and is often fished for with a rod and line, merely for the sake of the curious spectacle which it exhibits by these violent alternations. On its first feeling the hook, it appears agitated beyond measure. Its spines are erected, and its body swelled into the form of a ball, and thus for a considerable time it moves rapidly in various directions, as if surprised and maddened by the failure of all its efforts at revenge and extrication. Being at length exhausted, its spines are levelled, and it assumes a flat form. As it is drawn near the shore, it exhibits again all its fierceness, in which state it is thrown upon the land, and there suffered for some time to remain till death extinguish its resentments and vitality.

DIOECIA, in the Linnæan system of botany, the twenty-second class of plants. To this belong the willow, hemp, poplar, juniper, pistacchia, yew, &c. in all which, the female plants alone produce seeds; but even those prove barren, unless planted near the male plants, so as to be within the reach of the farina fœcundans.

DIOMEDIA, the albatross, in natural history, a genus of birds of the order anseres, of which there are many species. The diomedia exulans, or wandering albatross, is found in many parts of the world, but is very abundant at the Cape of Good Hope. Its length is sometimes four feet, and its extent, from wing to wing, ten. Its sounds are harsh, and thought to resemble the braying of an ass. Its arrival at Kamschatka is regarded as an infallible presage of the speedy arrival of vast shoals of fish; upon, these, however emaciated when it arrives, it fattens within a very short time. It quits Kamtschatka in August, and retires to Patagonia and the Falkland islands, where it builds its nest with earth, on the ground, a foot in height, and of a circular figure. While the female sits, the male is incessant in his assiduities to provide for her subsistence, and both are so tame as to permit any person to push them from their nest, and deprive them of their eggs, without the slightest resistance.

DIOPTRICS, the science of refractive vision, or that part of optics which considers the different refractions of light in passing through different media, as air, water, glass, &c. See OPTICS.

DIPLOMA, an instrument or license given by colleges, societies, &c. to a clergyman to exercise the ministerial function, or to a physician to practise the profession, &c. after passing examination or admitting him to a degree.

DIPLOMATIC LETTERS. This is the art of reading letters written in cypher, and is founded on a knowledge of the art of writing according to this method of concealment. In examining a piece in newly invented characters we should endeavour to ascertain, whether the number of characters correspond, or nearly so, with the ordinary number of alphabetical letters. We must observe which of the characters, whether taken singly or combined, occur oftenest in the whole specimen; and of these probably the most frequent will represent *e, a, i, o; e* being much more common than the rest of the vowels, but *u* and *y* are even less frequent than many of the consonants. Endeavour next to ascertain the beginning and ending of words which are sometimes distinguished by spaces or points, or the insignificant marks interposed; but however it be done, you must expect these signs to occur after every few letters, and the frequency of their occurrence may serve as some guide. When you have found out the distinction between words, take particular notice of the order, number, frequency, and combination of the letters in each word, and first examine the characters of which the shortest monosyllables are composed. Remember (1.) That no word can be without a vowel, a word of one letter must, therefore, be a vowel, or a consonant with an apostrophe: (2.) That the vowels are more frequently doubled at the beginning of words than the consonants; indeed the latter are only doubled at the beginning of Spanish and Welsh words: (3.) That the vowels mostly exceed the consonants in short words; and when the double consonants are preceded by a single letter, that this letter is a vowel (4.) That the single consonant which precedes or follows double consonants is *l, m, n*, or *r*: (5.) That the letter *q* is always followed by *u*, and when two different characters occur, the latter of which is often joined with other letters, but the former never found alone, nor joined with any than the latter, those characters stand for *qu*, which two, excepting a few Scottish names, are always followed by a vowel: 6. That although every language has something peculiar in its structure, the foregoing observations will apply with little variation to all the European languages.

In the English, *and*, and *the*, are more often found than any other words, *h* is frequently preceded by *w, c, s*, and *t*: *y* is seldom used in the middle of a word: the double letters *ll, ss*, appear frequently at the end of words; *ed, ty, ly, ing*, and *tion*, are very common terminations; *em, in, com*, and *con* are frequent prepositions: *a, i, o*, may stand alone: *o* is often followed with *u*; *e* is much more frequent in the beginning of words than the middle; and in the English the *e* is perpetually employed, as in *yes, yet, her, never, me, we, he, the, she, they, ye, fee, see, be, ever, speed, need, deference, excel, excess, &c.* When you meet with a character doubled in the middle of a word of four letters, it will be necessary to consider what words of four letters are so spelled. It is probable the vowels *o* or *e* are these; as *meet, feel, good, book, look*, &c. In polysyllables, where a double character occurs in the middle of a word, it is for the most part a consonant, and if so, the preceding letter is always a vowel. See NICHOLSON'S BRITISH CYCLOPEDIA.

DIPPING, among miners, signifies the interruption, or breaking off of the veins of ore, an accident often attended with much trouble, before the ore can again be discovered.

DIPSACUS, in botany, contains four species, of which the dipsacus fullonum, or cultivated teasel, is reared in great quantities, in the west of England, for raising the nap upon woollen cloths, by means of crooked awns upon the heads. For this purpose they are fixed on the circumference of a large broad wheel, which turns round while the cloth is held against them.

DIPTERA, an order of insects in the Linnæan system, which contains such insects as are furnished with two wings only; such as gnats, flies, and a variety of other insects. Under each wing is a clavate balancer or poiser with its appropriate scale.

DIPUS, the *Jerboa*, a genus of Mammalia in natural history, containing four species. The Dipus sagitta, or Egyptian jerboa, is about the size of a rat, and was known to the ancients by the name of the two-footed mouse. It is found in various parts of Africa, and in the eastern provinces of Siberia. In its posture and motions it resembles a bird. It inhabits subterranean apartments, in which it reposes during the day, choosing the night for its excursions and for obtaining its food. In Egypt jerboas are used as food; are extremely fond of basking in the sun when tame, and are often very playful and alert.

DIRCA PALUSTRIS, Leather wood. This is a low shrub, and native of the United States, growing in moist shady places, seldom rising more than four feet high, spreading into a head, with many small and very flexible branches. The flowers are produced at the extreme ends of the former years' shoots; they are of an herbaceous colour, and make a tolerable appearance. The flowers, which appear the latter end of March, before any perfect leaves, are of a yellow colour. The bark is uncommonly tough, yet the enclosed wood is very brittle. It was highly valued by the native Indians, and used in the place of cords. This plant, according to the information of Mr. W. BARTRAM, occupies an extensive range of territory, from Canada to Georgia.

DIRECTOR, in commercial polity, a person who has the management of the affairs of a trading company: thus we say the Directors of the India Company, South-Sea-Company, &c. See COMPANY.

DIRECTOR, in surgery, a grooved probe to direct the edge of the knife or scissars in opening sinusses or fistulæ, &c. that by this means the subjacent nerve and tendons may remain unhurt.

DISC, *Discus*, in antiquity, a quoit made of stone, iron, or copper, five or six fingers broad, and more than a foot long, inclining to an oval figure, which was hurled in the manner of a bowl, to a vast distance, by the help of a leathern thong tied round the person's hand who threw it, and put through a hole in the middle. Homer has made Ajax and Ulysses great artists at this sport; and Ovid, when he brings in Apollo and Hyacinth playing at it, gives an elegant description of this exercise, lib. x. ver. 175.

DISC, in astronomy, the body and face of the sun and moon, such as it appears to us on the earth; or the body or face of the earth, such as it appears to a spectator in the moon, &c. The disc in eclipse is supposed to be divided into twelve equal parts, called digits: in a total eclipse of the luminaries, the whole disc is obscured; in a partial eclipse, only a part thereof. If we imagine a plane to pass through the centre of the earth, so that the line which joins the centres of the sun and earth, may be perpendicular to this plane, it will make on the surface of the earth a circle, which will separate the illuminated hemisphere of the earth from the dark. This circle, otherwise termed the circle of illumination, M. KEIL calls the illuminated disc of the earth, which is directly seen by a spectator placed at the distance of the moon, in the right line which joins the centres of the sun and earth. All lines drawn from the centre of the sun to every single point of the disc are to be accounted parallel; and, therefore, since that line which is drawn to the centre of the disc is perpendicular to it, all the rest will be perpendicular to it, and therefore all lines drawn from the centre of the sun, and passing through every point of any circle upon the earth's surface, when they are produced, will be perpendicular to the plane of the disc. Moreover, a spectator in the moon will see all countries, cities, and towns to move upon the disc, which motion is occasioned by the earth's rotation round its axis, and every point will have its way on the disc: the bigness of the earth's disc is to be estimated by the angle under which the earth is seen from the moon.

DISCIPLE, one who learns any thing from another: thus, the followers of any teacher, philosopher, &c. are called disciples. In the Christian sense they were followers of Jesus Christ, in general; but in a more restrained sense, the disciples denote those alone who were the immediate followers and attendants on his person, of which there were seventy or seventy-two. The names *disciple* and *apostle* are often synonymously used in the gospel-history, but sometimes the apostles are distinguished from disciples as persons selected out of the number of disciples, to be the principal ministers of his religion; of these there were only twelve. The Latins kept the festival of the seventy or seventy-two disciples on July 15, and the Greeks on January 4.

DISCORD, in music, the relation of the two sounds which are always and of themselves disagreeable, whether applied in succession or consonance. Thus the second, fourth, and seventh, with their octaves, and, in general, all intervals, except those few which precisely terminate the concords, are called discords. Discords are distinguished into concinnous and inconcinnous intervals.

DISCOUNT, a compensation for the advance of money which is not due till after a certain period, which in Pennsylvania, is at the rate of 6 per cent. per annum. Thus if a person is entitled to $100 at the end of a year, he usually pays $6 to get the money at present.

Discount, in commerce, a term among traders, merchants, and bankers. It is used by the two former on occasion of their buying commodities on the usual time of credit, with a condition that the seller shall allow the buyer a certain discount at the rate of so much *per cent. per annum*, for the time for which the credit is generally given, upon condition that the buyer pays ready money. Among bankers, it is an allowance for ready money upon a note or bill of exchange.

DISEASE, is that condition of the body, in which it has declined from a state of health, so that its different functions are either greatly impeded, or performed with difficulty.

DISEASES of PLANTS, are divided by Tournefort into the following classes: 1. Those which arise from too great an abundance of sap; 2. From having too little; 3. From its bad qualities; 4. From its unequal distribution; and 5. From external accidents.

An abundance of sap causes plants to vegetate so luxuriantly, that they seldom arrive at the requisite degree of perfection. Wheat is in some climates subject to a disease of this nature, in consequence of excessive vegetation, without producing ripe grain. Such a defect may likewise be artificially induced, by planting any species of corn in too rich a soil: too much rain will be attended with a similar effect. When a vegetable is supplied too abundantly with juices, it is very apt to rot; one part of it overshadowing the other so as to prevent the access of fresh air, for want of which it prematurely undergoes putrefaction. In grasses, however, (fescue excepted,) or in any herbaceous plant, too great luxuriance, so far from being a disease, is a very desirable property. According to Dr. Home ("*Principles of Agriculture and Vegetation*") dung is a great preventive of diseases, arising from abundant moisture. The want of nourishment in plants may be easily ascertained by their decay: in which case the only remedy is, to remove from their vicinity such vegetables (and particularly weeds), as impede the growth of those we are desirous to cultivate.

The bad qualities, or unequal distribution of the juices of plants, occasion but few diseases which affect vegetables in this country, so that they are principally liable to external accidents, especially to the depredations of insects, such as snails, caterpillars, grubs and flies, to which we refer. See also Beetle, Chafer, Crab, and Corn-Butterfly.

The diseases which our gardeners chiefly observe, are:

1. *Barrenness;* when the tree, though apparently fresh and healthy, bears no blossoms; or, if it produce any, they soon fall off; or, should they *set*, the fruit drops before it arrives at maturity.

2. *Blasting of the buds*, occasioned by a frost happening while the leaves and blossoms are wet; in consequence of which the pores are contracted, and the vital juices obstructed: thus, if the sun begins to shine suddenly, they turn yellow, producing round fiery specks, whence frequently proceed tumours somewhat similar to warts, which rot, and generate maggots. Mr. Mortimer adds, that the want of rain, during the *blossoming time*, often dispose the blossoms to drop, from a deficiency of sap; to prevent which he recommends frequent watering.

3. *Blight;*
4. *Smut;*
5. *Mildew;*
6. *Honey-dew;*
7. *Moss;* to which articles we refer.
8. *Dropsy;*
9. *Gangrene;*

10. *Rotten roots;* an incurable disease, occasioned by setting the plants too deep.

11. A kind of *mildew* arising from a thick fog, or too abundant dew; which, however, affects the plants only in a slight degree.

12. *Falling of the leaves*, caused by the trees sprouting too early, or when they are attacked by too sudden heat or cold.

13. The *Scurf or Leprosy*, a disease which is confined to the bark, and is produced by excessive dilatation of the pores, through which too great a proportion of perspirable matter exudes; so that by adhering to, and hardening on the bark, it causes the latter to chap and crack, while it obstructs all perspiration. Thus, the viscous rind or skin, furnishes a secure retreat for vermin, which live both on the bark and on the tree.

To these various diseases should be added the injury done to trees, by deer, hares, and rabbits, barking them. The best defence against the first of those animals, is to *pale* them round, or to paint the lower part of the tree; but the former method is preferable. Hares and rabbits may be kept off by tying bands of straw round the trunk of every tree, as far as they can reach. Some persons make use of a composition of tar and lime, which certainly is not less injurious to the growth of trees than the depredations of hares or rabbits. In general, where any defence is requisite, straw-bands afford a tolerable security.

14 *Etiolation* ; from want of light.
15. *Suffocation* ; from want of air.
18. *Contortion* ;
19. *Consumption* ;
20 *Old age*.

DISSENTERS, separatists from the services and worship of the church of England. At the revolution, a law was enacted, that the statutes of queen Elizabeth and king James I. concerning the discipline of the church, should not extend to the Protestant dissenters. Persons dissenting, however, are to subscribe the declaration of 30 Car. II. cap. 1. and take the oaths of fidelity, &c. Besides, they are not to hold their meetings till their place of worship is certified to the bishop, or to the justices of the quarter-sessions, and registered. Also, they are not to keep the doors of their meeting-houses locked during the time of divine-service. And to secure to them the free exercise of their religion, whoever disturbs or molests them in the performance of divine worship, on conviction at the sessions, is to forfeit twenty pounds, by the statute of William and Mary. Unless dissenters conform and receive the sacrament, as administered by the church of England, they are excluded from holding any public places under the government. The dissenters, tolerated by law, may be reduced to six classes, *viz.* Presbyterians, Independents, Baptists, Quakers, Moravians, and Socinians or Unitarians. The principles on which dissenters separate from the church of England, are the same with those on which she separates herself from the church of Rome; these are, the right of private judgment, liberty of conscience, and the perfection of Scripture, as the Christian's only rule of faith and practice. They maintain that Christ, and he alone, is the head of the church, and that they bow to no authority in matters of religion, but that which proceeds from him. By ignorant people, dissenters are often treated with scorn, but by the liberal, and those who are capable of appreciating their merit and character, they have met with a better reception in all ages, since they thought it right to abandon their secular interests for the sake of preserving their integrity. Dr. Taylor, speaking of the Dissenters who were ejected from their livings by the licentious Charles II. in 1662, says, "They were men prepared to lose all, and to suffer martyrdom itself, and who actually resigned their livings, rather than desert the cause of civil and religious liberty, which, together with serious religion, wauld, I am persuaded, have sunk to a very low ebb, had it not been for the noble stand which these worthies made against imposition upon conscience, profaneness, and arbitrary power. They had the best education England could afford: most of them were excellent scholars, judicious divines, pious, faithful, and laborious ministers, undaunted and courageous in their Master's work, standing close to their people in the worst times, diligent in their studies, solid, affectionate, powerful, awakening preachers, aiming at the advancement of real vital religion in the hearts and lives of men, which flourished wherever they had influence."

DISTANCE, in astronomy. The real distances of the sun and planets are found from their parallaxes. See Parallax. With respect to the planets, as the distance of the earth from the sun has been found by transits of Venus to be 95 millions of miles; from this one distance and the periodic times of the planets, the respective real distances of the whole may be found by means of Kepler's law, "that the "squares of the periodic times are as "the cubes of their mean distances from "the sun."

Distance, *apparent*, in optics, is that distance which we judge an object is placed at, when seen afar off, being usually very different from the true distance; because we are apt to think that all very remote objects, whose parts cannot be well distinguished, and which have no other object in view, near them, are at the same distance from us, though perhaps the one is millions of miles nearer than the other, as is the case with regard to the sun and moon.

Distance *of the eye*, in perspective, is measured by a line drawn from the eye to the principal point: but the "point of distance" is a point in the horizontal line at such a distance from the principal point, as is that of the eye from the same.

Distance, as applied to the turf, is a

length of 240 yards from the winning post of a race course: precisely at which spot is fixed a post corresponding with others, but having a gallery capable of holding three or four persons, which is called the distance post. In this gallery as well as in that of the winning post, before the horses start each heat a person is stationed holding a crimson flag; during the time the horses are running, each flag is suspended from the front of the gallery to which it belongs, and the flag is inclined forward as a horse passes either post. Now if there be any horse which has not come up to the distance post, before the first horse, in that heat, has reached the winning post, as is manifested by the motion of this flag, such horse is said to be "distanced," and is incapable of running any more during that race.

DISTEMPER is frequently used in the same sense as disease, [but is applied to so many disorders among dogs and cattle, that no precise meaning can be considered as affixed to it.—T. C.]

DISTILLING, or Distillation, the art of separating alcohol from fermented fruits or grain, by the aid of fire; then collecting and condensing the alcohol by the application of cold.

All bodies which are capable of the vaporous form, at the same time that they are not decomposed, or otherwise changed in their properties, are capable of being separated from other matter by distillation. The process employed for distilling liquid bodies from other matter, is simply called distillation, that on the contrary used to separate solid bodies, by giving them the elastic form, is termed sublimation. The apparatus employed for the first process are of several kinds, suited to the nature of the volatile body. That employed for the distillation of water, alcohol, essential oils, simple waters, &c. is called a still.

It is observable in distillation that one volatile substance will frequently carry along with it other bodies of considerable fixity. From the affinity which water has to air, the evaporation of the former will take place at all temperatures below its boiling point, and though it has been thought that water might be freed from saline matter by distillation, it is found by experiment that several salts are carried over with the vapour of the water, which in their dry state would undergo decomposition before they would be induced to assume the elastic form. Hence water by the common mode of distillation, cannot be rendered pure. From the circumstance, that the air is capable of raising water and other liquids at a low temperature, we are enabled to perform the distillation of such liquids by making a slight degree of difference of temperature between the retort and the receiver. Water and alcohol may be obtained perfectly pure, by placing the retort in the temperature of 100° and the receiver in that of 50° Fahrenheit.

Explanation of the annexed engraving of Anderson's Patent Condensing Tub.

A. Still to contain 110 gallons, exclusively of the head, as near this shape as possible.

B. Half globe made of copper 30 lbs. to the sheet, bottom of copper a thimble on the centre of the top, 24 inches in the bottom, and 16 high.

C. Tub for holding the charge of wash, 36 inches wide in the bottom, 33 at top, and 34 deep, made of 1¼ cedar or white pine.

D. Small brass cock, to be opened when the charge is let into the still from the tub.

E. Stuffing box made of copper, to prevent the steam escaping by the spindle; the box stuffed with tow, and screwed down fast.

F. Pipe from the head of the still 4½ inches wide.

G. Pipe: the lower end fitting into the pipe F, and receiving the pipe H, and large enough to slip up on the pipe H, so as to leave the head free to be taken off.

H. Pipe: the lower end fits into the pipe G, and passes through the bottom 4 inches, to prevent the condensed steam returning into the still, and fastened firmly in the bottom of the half globe.

I. Pipe to convey off the condensed steam into the worm, fitted even in the bottom of the half globe; the other end fits into the mouth of the worm.

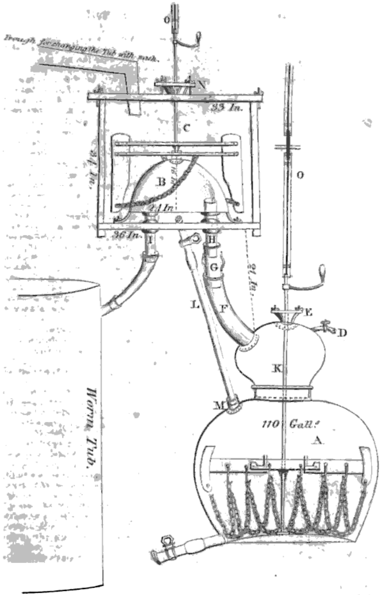
K. Iron spindle, with its handle to stir the still, with the cross piece and chains.

L. Charging pipe, 3 inches wide, with a large cock screwed into the bottom of the tub, the lower end fitting into the pipe M, in the breast of the still.

N. Stuffing box made of wood.

O. Spindles when used by water.

[*A cheap Cooler.* A trough 8 feet long 18 inches deep, one foot wide at the bottom, and 18 inches wide at top, filled with water through which the dis-



Anderson's
Patent Condensing Tub.

tilled vapour passes with a little descent, greatly economises water.—T.C.]

For the information of those who are unacquainted with this process, we shall here subjoin a few directions for making some of such compound waters or spirits as are in more general estimation.

1. *Clove-water:* Take 4 lbs. of bruised cloves, half a pound of pimento, or all-spice, and 16 gallons of proof spirit. Digest the mixture in a gentle heat, and then draw off fifteen gallons, with a somewhat brisk fire. The water may be coloured red, either by a strong tincture of cochineal, or of corn-poppy flowers; and sweetened at pleasure with double-refined sugar.

2. *Lemon-water:* Take of dried lemon-peel 4 lbs.; pure proof spirit, 10½ galls. and one of water; draw off ten gallons by a gentle fire, and dulcify the compound with fine sugar.

3. *Orange water:* Take of the yellow part of fresh orange-peel, 5 lbs.; clean proof spirit, 10 gallons and a half; water, 2 gallons; and draw off ten, over a slow fire.

4. RATIFIA, which see.

5. USQUEBAUGH, to which we refer.

DISTORTION, is that irregular growth, or unnatural motion, by which any part of animal bodies becomes deformed. [When these happen, let a surgeon be called in as early as possible.—T. C.]

DISTRESS, in law, the seizing or distraining any thing for rent in arrear, or other duty unperformed. The effect of this distress is to compel the party either to replevy the things distrained, and contest the act of trespass against the distrainer; or rather to oblige him to compound and pay the debt or duty, for which he was so distrained. There are likewise compulsory distresses in actions, to cause a person to appear in court; of which kind there is a distress personal of his moveable goods, and the profits of his lands, for contempt in not appearing after summons; there is likewise distress real of a person's immoveable goods. In these cases none shall be distrained to answer for any thing touching their freeholds, but by writ. Distress may be either finite or infinite: finite distress is that which is limited by law, in regard to the number of times it shall be made, in order to bring the party to a trial of the action. Infinite distress is that which is without any limitation, being made till the person appears: it is farther applied to jurors that do not appear as upon a certificate of assize, the process is *venire facias, habeas corpora*, and distress infinite. It is also divided into grand distress and ordinary distress: of these, the former extends to all the goods and chattels that the party has within the county. A person, of common right may distrain for rents and all manner of services: and where a rent is reserved on a gift in tail, lease for life, or years, &c. though there be no clause of distress in the grant or lease so as that he has the reversion: but on the feoffment made in fee, a distress may not be taken unless it be expressly reserved in the deed.

DITCH, in agriculture, a common fence, or inclosure, in marshes or other wet lands, where hedges cannot be conveniently planted.

[In America wooden fences are so general, as to render it needless to dwell on the subject of ditching.—T.C.]

DITTANY, the WHITE, or *Dictamnus Fraxinella*, L. an exotic perennial plant, growing in France, Germany and Italy. Its thick, pungent, and bitter root, produces annually erect stalks, which bear loose spikes, of white, red, and purple flowers, in June and July.

DIURETICS, a term applied to those medicines which increase the secretion of urine in the kidneys.

DIVAN, a council-chamber, or court in which justice is administered, in the eastern nations, particularly among the Turks. There are two sorts of divans, that of the grand seignior, called the council of state, which consists of seven of the principal officers of the empire; and that of the grand vizir, composed of six other vizirs or counsellors of state, the chancellor, and secretaries of state for the distribution of justice.

DIVIDEND, is the proportion of profits which the members of a society or public company, receive at stated periods according to the share they possess in the capital or common stock of the concern.

DIVIDING INSTRUMENTS are contrivances invented for the purpose of making with accuracy the graduations upon astronomical and mathematical instruments.

DIVINING ROD. The *Virgula divinatoria*, or divining rod, is a forked branch, or two shoots, or young branches of a fruit-bearing tree, tied together at one end, and held by the other ends, one in each hand. When held in a certain position, and under certain circumstances, it is said by cheats, who do know better, and by ignorant people who do not, to discover the situation of metals, &c. in the earth, by dipping as it approaches the place beneath which they immediately lie.

DIVING, the art of descending under water to considerable depths, and abiding there a competent time. The uses of diving are very important, particularly in the fishing for pearls, corals, sponges, &c. The most remarkable diver was Nicolo Pesce, who, according to the account given by KIRCHER, was able to spend five days together in the waves, without any other provisions than the fish which he caught and ate raw. He would swim from Sicily to Calabria, carrying letters from the king. At length he met his fate in exploring the depths of Charybdis, at the instance of the king; who, after he had once succeeded in fetching up a golden cup that had been thrown in, ordered him to repeat the experiment. There have been various engines contrived to render the business of diving safe and easy; the great point is to furnish the diver with fresh air, without which he must either make a short stay or perish. Those who dive for sponges in the Mediterranean, carry down in their mouths sponges dipt in oil; but, considering the small quantity of air that can be contained in the pores of a sponge, and how much that little will be contracted by the pressure of the incumbent air, such a supply cannot subsist a diver long, since a gallon of air is not fit for respiration above a minute.

DIVING-BELL, a machine contrived for the safe conveyance of a diver to any reasonable depth, and whereby he may stay more or less time under water, as the bell is greater or less. Dr. HALLEY's was three feet wide at top, and five at bottom, and eight feet high, and contained about sixty-three cubic feet, or near eight hogsheads in its concavity. This was coated with lead, so heavy, that it would sink empty, and the weight was distributed about the bottom, so that it would go down in a perpendicular position, and no other. In the top was fixed a strong, but clear glass, to let in the light from above; and likewise a cock to let out the hot air that had been breathed; and below was fixed a circular seat for the divers to stand on to do their business. This machine was suspended from the mast of a ship by a sprit, which was sufficiently secured by stays to the masthead, and was directed by braces to carry it overboard, clear of the side of the ship, and to bring it in again. To supply the bell with air under water, two barrels, of about sixty-three gallons each, were made, and cased with lead, so that they might sink empty, each having a hole in its lowest part to let in the water, as the air in them is condensed in their descent, and to let it out again when they were drawn up full from below; and to a hole in the top of the barrel was fixed a hose, or hollow pipe, well prepared with bees-wax and oil, which was long enough to fall below the hole at the bottom, being sunk with a weight appended, so that the air in the upper part of the barrels could not escape unless the lower end of these pipes were first lifted up. These air barrels were fitted with tackle proper to make them rise and fall alternately, like to buckets in a well. In their descent they were directed by lines fastened at the under edge of the bell to the man standing on the stage to receive them, who, by taking up the ends of the pipes above the surface of the water in the bell, gave occasion for the water in the barrels to force all the air in the upper parts into the bell, while it entered below, and filled the barrels; and as soon as one was discharged, by a signal given, it was drawn up, and the other descended to be ready for use. As the cold air rushed into the bell from below, it expelled the hot air through a cock at the top of the bell, which was then opened for that purpose. By this method, air is communicated so quick and in such plenty, that the doctor tells us, he himself was one of the five who was at the bottom in nine or ten fathoms water, for above an hour and a half at a time, without any sort of ill consequence; and he might have continued there as long as he pleased, for any thing that appeared to the contrary. In going down it is necessary it should be very gentle at first, that the dense air may be inspired to keep up, by its spring, a balance to the pressure of the air in the bell: upon each twelve feet descent, the bell is stopped, and the water that enters is driven out by letting in three or four barrels of fresh air. By the glass above, so much light was transmitted, when the sun shone, that he could see perfectly well to write and read, and by the return of the air-barrels, he could send up orders, written with an iron pen, on small pieces of lead, directing, that they were to be moved from place to place: but in the dark weather, when the sea was rough and troubled, it would be as dark as night in the bell; but then the doctor perceived he could keep a candle burning in the bell as long as he pleased, it being found, by experiment, that one candle consumes much about the same quantity of confined air, as one man does, viz. about a gallon per minute. The only inconvenience the doctor complained of was, that upon first going down, they felt a small pain in their ears, as if the end of a quill were forcibly thrust into the hole of the ear. This may proceed from its being some time before the air can get from the mouth, through the small canal of the Eustachian tube, which leads to the inner cavity of the ear, where, when it comes, it makes an equilibrium with the outward air, pressing on the tympanum, and thus the pain, for a short time, ceases: then descending lower, the pain of the ear returns, and is again abated; and so on till the bottom is gained, where the air is of the same density continually. This bell was so improved by the doctor, that he could detach one of his divers to the distance of fifty or a hundred yards from it, by a contrivance of a cap, or head-piece, somewhat like an inverted hand-basket, with a glass in the fore-part, for him to see his way through. This cap was of lead, and made to fit quite close about his shoulders: in the top of it was fixed a flexible pipe, communicating with the bell, and by which he had air, when he wanted, by turning a stop-cock near his head-piece. There was also another cock at the end in the bell, to prevent any accident happening from the person without. This person was always well clothed with flannels, which were warmed upon him before he left the bell and would not suffer the cold water to penetrate. His cap contained air enough to serve him a minute or two, then by raising himself above the bell, and turning the cock, he could replenish it with fresh air. This pipe he coiled round his arm, which served him as a clue to find his way to the bell.

DIVISIBILITY, that property by which the particles of matter in all bodies are capable of separation, or disunion from one another. As it is evident that body is extended, so it is no less evident that it is divisible, for since no two particles of matter can exist in the same place, it follows, that they are really distinct from each other, which is all that is meant by being divisible. In this sense the least conceivable particle must still be divisible, since it will consist of parts which will be really distinct. Thus far extension may be divided into an unlimited number of parts, but with respect to the limits of the divisibility we are still in the dark. We can, indeed, divide certain bodies into surprisingly fine and numerous particles, and the works of nature offer many fluids and solids of wonderful tenuity; but both our efforts, and those naturally small objects, advance a very short way towards infinity. Ignorant of the intimate nature of matter, we cannot assert whether it may be capable of infinite division, or whether it ultimately consists of particles of a certain size, and of perfect hardness. We shall add a few instances of the wonderful tenuity of certain bodies, which have been produced either by art, or discovered by means of the microscope among the works of nature. Mr. BOYLE mentions that two grains and a half of silk was spun into a thread 300 yards long: and a lady spun from a pound of wool, a thread equal to 95 English miles in length.

The ductility of gold likewise furnishes a striking example of the great tenuity of matter, for a single grain of this metal has been actually divided into at least half a million of particles, each of which is perfectly apparent to the naked eye. The animal, vegetable, and even mineral kingdom furnish numerous examples of the subtility of matter. What for instance must be the tenuity of the odoriferous particles of musk, when we find that a piece of it will scent a whole room, in a short time, and yet will hardly lose any sensible part of its weight. The human eye, unassisted by glasses, can frequently perceive insects so small as to be barely discernible. Now it is obvious that the limbs, the vessels, and other parts of such animals, must infinitely exceed in fineness every endeavour of human art. But the microscope has discovered wonders that are vastly superior, and such indeed as were utterly unknown to our forefathers, before the invention of that instrument. Insects have been discovered so small as not to exceed the 10,000 part of an inch in length: so that 1,000,000,000,000 of them might be contained in the space of one cubic inch: yet each living animal must consist of parts connected with each other: with vessels, with fluids, and with organs necessary for its motions, for its increase, and for its propagation. How inconceivably small must those organs be, and yet they are, unquestionably, composed of other parts still smaller, and still farther removed from the perception of our senses.

DIURNAL, in astronomy, something relating to the day, in opposition to nocturnal, which regards the night.

Diurnal *arch*, the arch or number of degrees that the sun, moon, or stars describe between their rising and setting.

Diurnal *motion of a planet*, is so many degrees and minutes as any planet moves in twenty-four hours. Hence the motion of the earth about its axis, is called its diurnal motion.

The diurnal phænomena of heavenly bodies, arise from the motion of the earth round its axis: for since the earth turns round its own axis from west to east, every spectator on its surface must necessarily be carried round in the same way; and consequently those parts of the heavens which lie toward the east, will by and by come into his sight, and those which are visible to him, will depart out of it toward the west. Hence it is that the spectator not being sensible of his own motion, (the reason of which is, because all things about him move along with him) imagines the whole heavens to turn round the contrary way, viz. from east to west, every twenty-four hours, which is nearly the time in which the earth performs one revolution about its axis.

DOCK, or *Rumex*, L. a genus of perennial plants, comprising 39 species.

Dock, in maritime affairs, is a pit, great pond, or creek, by the side of an harbour, made convenient either for building or repairing of ships. It is of two sorts: 1. Dry-dock, where the water is kept out by great flood gates, till the ship is built or repaired, when the gates are opened, and the water let in to float and launch her. 2. Wet-dock, a place where the ship may be hauled into out of the tide's way, and so dock herself, or sink herself a place to lie in.

DOCK-YARDS, in ship-building, are magazines of all sorts of naval stores. The principal ones in England are those of Chatham, Portsmouth, Plymouth, Woolwich, Deptford and Sheerness. In time of peace, ships of war are laid up in these docks; those of the first rates mostly at Chatham, where, and at other yards, they receive from time to time such repairs as are necessary. These yards are generally supplied from the northern crowns with hemp, pitch, tar, rosin, &c. but masts, particularly those of the larger size, are brought from New England.

DOCTOR, a person who has passed all the degrees of a faculty, and is impowered to teach or practise the same: thus we say, doctor in divinity, doctor in physic, doctor of laws. The title of doctor seems to have been created in the twelfth century, instead of *master*, and established with the other scholastic degrees of bachelors and licentiates, by Peter Lombard and Gilbert Porreus, then the chief divines of the university of Paris. Gratian did the same thing, at the same time at the university of Bologna. Though the two names of doctor and master were used a long time together, yet many think that their functions were different, the masters teaching the human sciences, and the doctors those sciences depending on revelation and faith. Spelman takes the title of doctor not to have commenced till after the publication of *Lombard's Sentences*, about the year 1140, and affirms that such as explained that work to their scholars were the first that had the appellation of doctors. To pass doctor in divinity at Oxford, it is necessary the candidate have been four years bachelor of divinity. For doctor of laws, he must have been seven years in the university to commence bachelor of law, five years after which he may be admitted doctor of laws. Otherwise in three years after taking the degree of master of arts, he may take the degree of bachelor of laws, and in four years more that of doctor: which same method and time are likewise required to pass the degree of doctor in physic. At Cambridge, to take the degree of doctor in divinity, it is required that the candidate have been seven years bachelor of divinity: though in several colleges the bachelor's degree is dispensed with; and he may go out *per saltum*. To commence doctor in laws, the candidate must have been five years bachelor of laws, or seven years master of arts. To pass doctor in physic he must have been bachelor in physic five years, or seven years master of arts. It is remarkable, that by a statute of 37 Henry VIII. a doctor of civil law may exercise ecclesiastical jurisdiction, though a layman.

DODECAGON, a regular polygon of 12 equal sides and angles. If the side of a dodecagon be 1, its area will be equal to 11.2 nearly, and the areas of plane figures being as the squares of their sides, therefore 11.2 multiplied by the square of the side of any dodecagon will give its area. To inscribe a dodecagon in a given circle, carry the radius six times round the circumfeaence, which will divide it into six equal parts, or will make a hexagon; then bisect each of those parts, which will divide the whole into 12 parts, for the dodecagon.

DODECÆDRON, one of the platonic, or five regular bodies, being contained under a surface composed of twelve equal and regular pentagons.

DOG, (*Canis familiaris*,) characterised by Linnæus, as having the tail recurved, and bent towards the left side of the body.

Dogs are found in a wild state in Africa and South America.

As an attached and faithful servant of man the dog is equalled by no animal. Though destitute of the faculty of thought, he has all the ardour of sentiment. He is all zeal, warmth, and obedience; and, forgetful of injuries, seeks only how he may gain the favour and affection of his master. During the night he guards the house, and, by the noise he makes, gives notice of the approach of depredators. He also protects the property committed to his care, and secures it from being plundered. He directs the steps of the blind, and in some instances has even been instructed to pick up money, and put it into his master's hat. Being endowed with great strength and fleetness of foot, some kinds of dogs are trained to the chase, and taught not only to pursue and destroy noxious and savage beasts, but also to hunt for and secure animals as food for their master. And there are many countries, both of the old and new continent, in which, if man were deprived of this faithful ally, he would unsuccessfully resist the foes that surround him, and are incessantly on the watch to destroy his labour, attack his person, or encroach upon his property.

But it is not only during his life that the dog is serviceable to mankind. After death his *skin* is converted by the inhabitants of Greenland into garments, and particularly into stockings. It is also used for the coverlets of beds. Dogs' skins are tanned, and applied to several useful purposes, as leather, in our own country, and particularly for gloves and shoes. The *hair* of some kinds of dogs is so thick and matted, that like wool, it is capable of being converted into cloth. A small kind of King Charles's dog is mentioned by Dr. Anderson to have had long and soft hair, covering a finer sort, which might with advantage have been woven into shawls. He speaks of another kind which had a very thick fleece, much resembling that of some of the Lincolnshire sheep; and of a third kind with close frizzed wool, which was shorn annually and made into stockings. He however remarks that the finest hair he ever saw upon a dog, and which indeed for softness and gloss more resembled silk than hair, grew upon a very small kind of Maltese dog. This, if manufactured, would have afforded goods of uncommon softness and beauty. The fleece of a water dog belonging to the farrier of a troop of horse artillery was manufactured into hats, and answered this purpose sufficiently well. Each fleece was sufficient for two hats, and was considered to be worth about twelve shillings.

Disgusting as it may appear to us, the *flesh* of the dog is a favourite food in many countries. The Greenlanders eat it with avidity. In the markets of Canton, dogs are exposed for sale in the same manner as other animal food. The negroes of Africa prefer their flesh to that of many other quadrupeds; dogs being sold in some of their markets at as dear a rate as mutton or venison. With the North American Indians they are considered a great delicacy; and we are informed by Pliny, that the Romans were so partial to this kind of food, that a fricasee of sucking puppies was considered a favourite dish with even the most notorious Roman epicures. They even so much esteemed them as to offer them in sacrifice to their gods.

There are near thirty distinct and well ascertained varieties of the dog; of which fourteen are considered to be natives of Great Britain.

The *Siberian Dog* is distinguished by having its ears erect, and the hair of its body and tail very long.

To the inhabitants of many northern countries of the world these dogs are of essential service. They are employed in drawing sledges over the frozen snow, five of them being yoked to each sledge, two and two, with the fifth in front as the leader. These sledges generally carry only one person each, who sits sideways, and guides the animals by reins fastened to their collars; but more particularly by his voice, and a crooked stick which he carries in his hand. If the dogs be well trained, the charioteer has only to strike the ice with his stick to make them go to the left, and the sledge to make them go to the right: and, when he wishes them to stop, he places it betwixt the front of the sledge and the snow. When they are inattentive to their duty, he chastises them by throwing his stick at them; but great dexterity is generally requisite in picking it up again. So much, however, depends upon the excellence of the leader, that a steady and docile dog for this purpose is not unfrequently sold for as much as ten pounds sterling.

The fleetness of these dogs is so great that they have been known to perform a journey of 270 miles in three days and a half; and, with a sledge containing three persons and their luggage, they will travel sixty miles in a day. During the most severe storms, when their master cannot see his path, nor even keep his eyes open, they seldom miss their way. And it is said that, in the midst of a long journey, when it is found absolutely impossible to proceed any further, the dogs, lying round their master, will keep him warm, and prevent him from perishing by the cold.

The natives of Kamtschatka wear the *skins* of these animals as clothing, and consider the long hair as an ornament.

The *Newfoundland Dog*, for united size, strength, and docility, exceeds all the kinds of dog with which we are acquainted. As its name imports, it is a native of the island of Newfoundland; and also of the adjacent parts of America, where it is employed in drawing wood on sledges, from the interior of the country to the sea-coast. Four of these dogs are harnessed to each sledge, and are able with ease to draw three hundred weight of wood for several miles. And it is peculiarly deserving of remark that they often perform this service, without any driver. Before the introduction of horses into general use in Canada, most of the land-carriage was performed by dogs.

The ease with which the Newfoundland dog swims, and the strong attachment which he forms towards mankind, have rendered him of great service in cases of danger from the oversetting of boats, and other accidents by water.

The *Shepherd's Dog* is an animal of rude and inelegant appearance, has its ears erect or half erect, and the tail covered beneath with long hair.

In wide and extensive tracts of down or mountain that are appropriated to the feeding of sheep, it would be impossible for the shepherds to have any command over their flocks, without the assistance of this faithful and docile ally. At a word from his master he drives the sheep in order to and from their pasture, and will suffer no stranger from another flock to intrude upon his. If he observe any of the sheep attempt to stray, he springs forward in an instant to stop their course, however great the distance. These dogs drive the sheep entirely by their voice; never lacerating them, nor indeed ever employing force but for the preservation of peace and good order. When awake they are at all times alive to their master's directions; and, in repose, they lie down by his wallet, and defend it from plunder.

The *Water Dog* is principally distinguished by having its hair long and curled, like the fleece of sheep, its muzzle somewhat short, and the feet more webbed than those of most other dogs.

There are two kinds of water-dogs, which differ only in size, the one being nearly as large again as the other.

It is to sportsmen principally that these dogs are of use. Being fond of swimming, they are chiefly employed for fetching out of the water such game as has been shot and fallen into it.

Their *fleece* has so near a resemblance to wool, that it is capable of being manufactured into a coarse kind of cloth, or of being made into hats.

The *Spaniel* is a dog with pendulous and woolly ears, the hair long on all parts of the body, but particularly on the breast, beneath the body, and at the back of the legs.

Like the water dog the spaniel is chiefly useful to sportsmen, in the shooting of water fowl. And when hawking was a fashionable recreation in England, this was the kind of dog always taken out to spring the game.

In all ages the spaniel has been noted for fidelity and attachment to mankind; and the instances that have been recorded of these are innumerable. The chief order of Denmark (now improperly denominated the order of the elephant) was instituted in memory of a spaniel, which had shown a peculiar attachment to the monarch, his master, when deserted by his subjects.

The *Setter* is a dog nearly allied to the spaniel, and is to this day frequently distinguished by the name of English Spaniel.

In some parts of England these dogs

are used in the field to discover and point out game to the sportsman. They are very tractable, and easily trained to their duty. And such are their muscular powers, that an instance has been related of one of these animals hunting all the fields adjoining to the road along which his master was riding, through a distance of nearly sixty miles.

The *Pointer* is a dog with smooth hair, stout limbs, blunt muzzle, and tail appearing as if in part cut off.

These dogs are in common use with sportsmen for discovering game, which they are taught to do with wonderful steadiness and attention. Aided by the acuteness of their smell, they gently approach the spot where the game lies, and at length stop, their eyes steadily fixed upon it, one foot generally somewhat raised from the ground, and the tail extended in a straight line. If the birds run, the dog discovers it, and steals cautiously after them, keeping still the same attitude; and when they stop he is again steady. It is by the assistance of pointers that game is chiefly killed in England.

Hounds are distinguished into three kinds, called the *harrier fox-hound*, and *stag-hound;* all of which are characterised by having their ears smooth and pendulous, and on each hind foot a spurious claw, called a dew claw.

Of these animals the first, which is the smallest, has its name from being employed in hunting the hare; the second is larger and more stout, and is used for hunting the fox; and the third, which is the largest, stoutest, and fleetest of the whole, is used for hunting the stag.

These animals are always taken to the field in packs, consisting of about twenty-five couple; and when in scent of their game, they unite in a loud yelling noise, which they continue so long as they are in pursuit.

The *Blood-hound* is larger than the common hound, and is generally of a deep tan or reddish colour, with a black spot over each eye.

In the early periods of English history, blood-hounds were in much greater request than at present.—They are indebted for their name to the faculty with which they are endowed, of being able to trace wounded animals by their blood. Their principal employment was to recover such game as, after having been wounded, had escaped from the hunters. In most of the royal forests blood-hounds are at this day kept, for tracing wounded deer; which they are able to do however distant their flight, or however thick the parts of the forest through which they may have passed. Deer stealers are also frequently discovered by means of these animals.

Blood-hounds were formerly used in certain districts on the confines of England and Scotland, to overawe or pursue the depredators of flocks and herds. Of late years they have been employed in the island of Jamaica, to discover the ambuscades of the Maroons, in their projected descent upon the whites; and, in the Spanish West Indian Islands, to traverse the country, in pursuit of persons guilty of murder and other crimes. The dogs are taught to act more by exciting terror than by attack; and criminals are taken by them, and brought to justice, without the slightest personal injury.

The *Grey-hound* is distinguished by his slender and curved body, his narrow muzzle, and his tail being curved upwards at the extremity.

Our ancestors so highly esteemed the grey-hound, that by the laws of king Canute it was enacted that no person under the degree of a gentleman should presume to keep a grey-hound. The pursuit of animals by these dogs is particularly denominated coursing. Those anciently coursed by them were the deer, the fox, and the hare; but they are now only used for coursing the hare. They hunt by sight, and not by scent; and their fleetness of foot is such that, in a hilly or uneven country, there are few horses which can keep pace with them.

The *Mastiff* is a dog of large size and robust body, and has the lips hanging down at the sides.

By the ancient Britons it was customary to train these dogs to be of use in war. With us they are chiefly employed as watch dogs; and they discharge this duty in many instances with great fidelity. Some of them will suffer a stranger to come into the inclosure they are appointed to guard, and will accompany him peaceably through every part, so long as he continues to touch nothing: but the moment he attempts to lay hold of any of the goods, or endeavours to leave the place, the animal informs him, first by growling, or if that be ineffectual, by harsher means, that he must neither do mischief nor go away. He seldom uses violence unless resisted; and in this case, will sometimes seize the person, throw him down, and hold him there for hours, or until relieved, without biting him.

When roused to fury the mastiff is one of the most tremendous animals with which we are acquainted, and consequently one of the most difficult to overcome in combat. He is, however, capable of a steady attachment towards his master, and will protect him from injury at the risk of his own life.

The *Bull Dog* is smaller than the mastiff, but in general form is nearly allied to it: the body is robust, the snout somewhat flatter than that of the mastiff; and the lips are pendulous at the sides.

For courage and ferocity, the bull dog is exceeded by no animal of its size. Since the horrid practice of bull-baiting has been discontinued, the race of these dogs has much declined: and the few that are now seen are employed by butchers and other persons as watch-dogs.

The *Terrier* is a small and hardy kind of dog, the name of which is derived from its usually subterraneous employments.

Some terriers are rough, and others smooth haired. They are generally of reddish brown, or black colour, short legged, and strongly bristled about the muzzle.

These dogs, the determined enemies of almost every species of vermin, are of great use to farmers and others, for the extermination of rats, polecats, and other similar depredators. They are also employed in driving foxes from their dens, and on this account are generally attendants upon every pack of fox-hounds. Formerly they were used in rabbit warrens, to expel these animals from their burrows. In character they are fierce, keen, and hardy; and being remarkable for vigilance, are admirable house-dogs.

The *Lurcher* is a dog apparently partaking of the nature both of the terrier and the grey-hound: there are two varieties, one covered with short, thick set hair, and the other with long and harsh hair.

As this dog hunts both by the sight and smell, and takes his prey without noise, he is frequently employed by poachers in their nocturnal excursions in pursuit of game. When in the midst of game the lurcher does not, like most other dogs, either bark or suddenly run upon it; but, by a seeming neglect, he deceives the object till it comes within reach, and then suddenly springs upon and secures it.

The *Turnspit* is a small dog, with short and generally crooked legs, and the tail curled upward.

These dogs were formerly much employed in the roasting of meat. For this purpose they were placed in a broad kind of wheel connected with the spit, which they turned round by running in it, as a squirrel does in its cage. They are still used in this capacity in most of the countries of the continent of Europe: but being now in little request, in England, the breed is nearly extinct there.

The *Wolf* (*Canis lupus*) is a very ferocious animal of the dog tribe, of brownish colour, with pointed nose, erect and sharp ears, and bushy tail bent inward.

This animal is found wild in most of the countries of the continent of Europe, and was formerly common in England.

The wolf affords to us nothing valuable but his skin, which makes a warm and durable fur.

In North Carolina there is a kind of wolf, the skins of which, properly dressed, make good parchment; and when tanned, are convertible into excellent summer shoes. The Indians frequently use these skins for beds, under an impression that they drive away bugs and fleas; and they imagine that nearly all parts of this animal are useful as remedies for different bodily disorders.

In the ancient periods of British history, wolves were so numerous and so destructive, that we are informed of places having been built in different parts of the island to defend passengers from their attacks. In the reign of Edward I. a royal mandate was issued to a person whose name was CORBET, to superintend and assist in the destruction of wolves, in the several counties of Gloucester, Worcester, Hereford, Salop, and Stafford; and numerous individuals held lands of the crown, by the duty of hunting and destroying wolves. The latest account that has occurred respecting the existence of wolves in England is under the date of 1281. The last wolf known to have been killed in Scotland was in the year 1680; and the date of the complete extinction of these animals in Ireland is 1710. They are very prevalent throughout North and South America.

The *Common Fox* (*Canis vulpes*) is an animal of the dog tribe, of brown colour, with sharp muzzle, erect and pointed ears, straight and bushy tail tipped with white.

This animal is found in almost every country of the four quarters of the world.

Although foxes occasionally commit great depredation in poultry-yards, and amongst game, they are serviceable to mankind by destroying many kinds of noxious animals. Their skin also constitutes a soft and warm fur, which in many parts of Europe is used for muffs and tippets, for the linings of winter garments, and for robes of state. So great is the demand for these skins, that, at Lausanne, there are furriers who in one winter have received betwixt two and three thousand of them from different parts of the adjacent country. The flesh of the fox is eaten by the inhabitants of some countries of the continent.

The cunning of this animal is proverbial. His numerous stratagems for obtaining prey and avoiding his enemies have been the admiration of mankind from the earliest ages. His usual residence is a den or large burrow formed under the surface of the ground, or in some deep crevice of a rock, which he seldom leaves except in the night, and then for the sake of prowling about for food. He feeds on nearly all the smaller kinds of animals, on hares, poultry, feathered game, moles, rats, and even on mice. He is likewise remarkably fond of fruit. His voice is a kind of yelping bark, that consists of a quick succession of similar tones, at the end of which he frequently raises it to somewhat like the cry of a peacock. His smell is peculiarly fetid and offensive.

The *Arctic Fox* (*Canis lagopus*) is an animal of the dog tribe, smaller than the common fox, of white or blueish grey colour, the hair very thick, long, and soft, the tail straight and bushy, and the feet very hairy.

The extreme parts of North America, and the country around the Frozen Sea, are those which the arctic fox principally inhabits.

These animals are principally killed on account of their skins, their fur being light and warm, though not durable.

The inhabitants of Greenland split the tendons, and use them as thread: they also sometimes eat the flesh of these animals.

The modes in which they are caught are various; by stone traps; in holes in the snow, the openings to which are surrounded by snares; in pitfalls, the surfaces of which are so covered that the animals are unable to discover them; and with arrows and guns.

Cunning and sagacious as the common fox is, there is reason to suppose the arctic foxes much more so. They associate together in large droves, and feed on whatever animal substances they can obtain, even fish and crabs; and, singular as it may appear, they destroy great numbers of feathered game.

Proper management of dogs. As these are, at all times, very valuable animals, it is matter of some importance to take care of their health. This depends much on their diet, and lodging: the frequent cleaning of their kennels, and giving them fresh straw for their couch, with plenty of water, are highly necessary.

With respect to food, carrion hurts their sense of smelling, in which their excellence in a great measure consists. Barley meal, the dross or grossest part of wheaten flour, or both mixed together with broth or skimmed milk, afford very wholesome nourishment. On account of the sanguine constitution of these animals, the greatest relief to them in summer is Couch-grass, or Dog's-Grass, to which we refer. Those who keep a complete kennel of dogs should purposely cultivate this plant in a place into which they may be turned every morning: here they will eagerly eat it, to relieve the disorder to which they are subject, and thus to cure the uncommon heat of their blood.

These animals are liable to various diseases; of which we shall mention only the following:

1. *Bites and Stings.* If dogs are bitten by any venomous reptiles, such as snakes, vipers, &c. the blood should be squeezed out, and the part washed with salt and urine, or volatile alkali; a plaster composed of calamint or plantain pounded in a morter, should then be applied to the wound.

2. *Mange*, to which we refer.

3. *Poison.* If there be reason to suspect that a dog is poisoned with *nux vomica* (which is often employed for that purpose by warreners, and causes convulsive fits) the most effectual remedy is to make him swallow, without loss of time, a considerable quantity of common salt, dissolved in the smallest proportion of water: this simple remedy may be administered by opening his mouth, and placing a stick across, to prevent him from shutting it, while his throat is filled with the solution. Thus

by holding his mouth upwards, a sufficient dose may be introduced, both to purge and vomit him. As soon as the stomach is properly cleared by a free passage downward, some warm broth should be frequently given to relieve his extreme faintness, which otherwise might prove fatal.

4. *Worms:* a disorder, with which young dogs in particular are very frequently troubled. All bitter substances are so offensive and nauseous to worms, that they are often voided in consequence of the animals taking a dose of calomel, and then two or three common doses of aloes, in the course of a week. Should this remedy fail, an ounce of the powder of tin, mixed up with butter, may be given in three potions, which generally destroys the worms, together with their seed.

5. *Coughs* and *Colds*. Dogs are very subject to a cough attended with extraordinary paroxysms of choking, which is often the consequence of a cold In this case, it will be necessary to bleed the animal affected, in small quantities; but if the disorder proceed from what is called the *distemper* in dogs, and they appear to be very low in spirits, blood-letting must not be attempted. Meat-broth, or milk-broth warmed, should then be the principal part of their diet, and the following medicine administered: Take flour of sulphur, cold drawn linseed oil, and salt-petre, of each one ounce; let them be well mixed together, and divided into four doses; one of which is to be taken every other day. Meanwhile, the creature affected should be furnished with plenty of clean straw to lie upon, and likewise swallow, at least, one spoonful of honey every day.

6. The *scab* or *itch*, though a rare disease in dogs, is sometimes very obstinate: it may, however, be easily cured by an ointment made of hog's lard and sulphur, with which a part of the back of the animal should be rubbed every day, and the application gradually extended, till the whole back from head to tail, and at length all the affected parts, have been anointed. Thus, the requisite portion of sulphur, which is a specific in those cases, will be introduced into the system, both by absorption, and the constant licking of the diseased creature.

7. *Madness.* See Bite & Hydrophobia.

[It has been ascertained that dogs that have been wormed, may have hydrophobia, but they are rendered incapable of biting: this process therefore should always be used to puppies.—T. C.]

DOG-FISH and Sharks (*Squalus*) constitute a tribe of sea-fish noted for their voracity, and peculiarly characterised by having instead of gills, from four to seven breathing apertures of curved form on each side of the neck.

They are found in all seas, and some of them are of enormous magnitude, measuring from twenty to thirty feet and upwards in length.

The skins of nearly all these animals, which are rough, with hard and minute prickles, are in frequent use for polishing wood, ivory, and even iron. Those of some of the larger species are cut into thongs and traces for carriages; and in Norway a sort of leather is prepared from them, which is employed for shoes and many other purposes of leather. The skin of the Spotted Dog-fish (*Squalus canicula*) is converted into the well known substance called *shagreen* or *chagreen*. For this purpose it is extended on a board and covered with mustard seed; and after having been exposed for several days to the effects of the weather it is tanned. The best shagreen is imported from Constantinople. This is of brownish colour, and very hard; but when immersed in water it becomes soft and pliable, and may be dyed of any colour. Shagreen is often counterfeited by preparing morocco leather in the same manner as the skins of the dog-fish. Such fraud may, however, easily be detected by the surface of the spurious manufacture peeling or scaling off, whilst that of the genuine article remains perfectly sound. Shagreen is employed principally to cover cases for mathematical instruments, and was formerly used for watch cases and the covers of books. *Shark's fins* are an article of trade from the Arabian and Persian gulfs to India, and from thence to China: they are generally packed in bales weighing each about 700 pounds.

The flesh of all the species of sharks is hard, and in general unpleasant both to the smell and the taste; yet is sometimes eaten by seamen, after having been macerated for a while in water to soften it. The eggs of sharks are also eaten. The livers of all the species yield a considerable quantity of oil, which is useful for burning and other purposes. From the livers of some of the larger kinds as much as seven or eight butts of oil have been obtained worth sixty or seventy dollars and upwards.

DOG-ROSE, the Common; Wild-briar, or Hep-tree, *Rosa canina*, L. an indigenous plant, growing in woods and hedges; in the month of June it bears oval flowers, which are succeeded by red, egg-shaped berries.

The blossoms of this plant, when distilled, afford a pleasant perfumed water. The leaves of every species of the rose, but especially those of the dog-rose, are recommended as a substitute for tea: when dried and infused in boiling water, they yield a fine colour, a somewhat astringent taste, and a grateful odour.

DOG'S-TAIL GRASS, the CRESTED, or *Cynosurus cristatus*, L. a perennial plant, which grows in dry pastures, on a moist clayey soil, and blows in July. Its leaves are shorter than those of any of the pasture grasses; but they grow closely together, in great abundance, and are very palateable to cattle, particularly to sheep.

2. C. *Echinatus*, L. Rough Dog's-tail grass, growing in moist, sandy, or clayey soils, flowering in the month of July: its stalk seldom exceeds the height of two feet.

3. C. *Indicus*, or Indian Dog's-tail grass, is a native of Pennsylvania.

DOLICHOS, *Sinensis*. Chinese Dolichos bean was first introduced into this city since the American war, from seeds found in a tea-chest, but a surgeon in the American army afterwards brought some from the nations of hostile Indians, to Mr. BARTRAM, who heard from another person that this species was found native far interior in the western country.

The famous *Soy bean* is a species of *Dolichos*. See article SOY.

DOMINICAL LETTER, in chronology, is that letter of the alphabet which points out in the calendar the Sundays throughout the year, thence also called *Sunday letter*. See *Calendar*. The distribution of days into weeks is marked by the seven first letters of the alphabet, A, B, C, D, E, F, G, beginning, at the first of January, to place the letter A; to the second of January B is joined; to the third C; and so on to the seventh, where G is figured: and then again beginning with A, which is placed at the eighth day, B will be on the ninth, C at the tenth, and so continually repeating the series of these seven letters, each day of the year has one of them in the calendar. By this means the last day of December has the letter A joined to it, for if the 365 days, which are in a year, be divided by seven, we shall have fifty-two weeks, and one day over. If there had been no day over, all the years would constantly have fallen on the same day of the week, and each day of the month would constantly have fallen on the same day of the week: but now, on account, that besides the fifty-two weeks in the year, there is one day more, it happens, that on whatever day of the week the year begins, it ends upon the same day, and the next year begins with the following day. The letters being ranked in this order, that letter which answers to the first Sunday of January, in a common year, will show all the Sundays throughout the year, and to whatever days in the rest of the months, that letter is put, these days are all Sundays. If the first day of January be on a Sunday, the next year will begin on Monday, and the Sunday will fall on the seventh day, to which is annexed the letter G, which therefore will be the Sunday letter for that year; the next year beginning on Tuesday, the first Sunday will fall on the sixth of January, to which is adjoined the letter F, which is the Sunday letter for that year; and in the same manner, for the next following, the dominical letter will be E; and so on. By this means the Sunday letters will go on in a retrogade order, viz. G, F, E, D, C, B, A. But because every fourth year consists of 366 days, the series of letters will be interrupted, and the order will not return till twenty-eight years, or four times seven; and hence arises the cycle of twenty-eight years. Thus, if in a leap year, the first of January be Sunday, and consequently the dominical letter A, the twenty-fourth day of February will fall on a Friday, and the twenty-fifth on a Saturday; and since both these days are marked in the calendar with the letter F, the following day, which is Sunday, will be marked with G, which letter will mark out all the Sundays, and consequently be the dominical letter the remaining part of the year; and hence it is that every leap year has two dominical letters, the first of which serves from the beginning of the year to the twenty-fourth or twenty-fifth day of February, and then the other takes place and serves for the rest of the year. The intercalary day is placed between the twenty-third and twenty-fourth day of February, and so makes two twenty-fourths of February, which in the calendar are esteemed one and the same day, and have the same letter affixed to them; but by our way of reckoning, they are called the twenty-fourth and twenty-fifth days of February. The dominical letter may be found by the following rule, for any year of any century:

"Divide the centuries by four, and twice what does remain,
Take from six; and then add to the number you gain,
Their odd years and their fourth, which dividing by seven,
What is left take from seven, the letter is given."

Thus for the year 1811, the dominical letter was F, for the centuries, 18, divided by 4, leave 2, the double of which taken from 6 leaves 2 again, to which add 11, the odd years, and their fourth part 2, the sum 15 divided by 7 leaves 1, which taken from 7 leaves 6, answering to F, the sixth letter in the alphabet.

DOMINICANS, an order of religious, called in France, jacobins, and in England, black-friars, or preaching-friars. This order, founded by St. DOMINIC, a native of Spain, was approved by INNOCENT III. in 1215, and confirmed by a bull of HONORIUS III. in 1216. The design of their institution was, to preach the gospel, convert heretics, defend the faith, and propagate Christianity. They embraced the rule of St. AUGUSTINE, to which they added statutes and constitutions, which had formerly been observed either by the Carthusians or Præmonstratenses. The principal articles enjoined perpetual silence, abstinence from flesh at all times, wearing of woollen, rigorous poverty, and several other austerities. This order has spread into all the parts of the world. It has produced a great number of martyrs, confessors, bishops; and they reckon three popes, sixty cardinals, 150 archbishops, and 800 bishops, of their order, besides the masters of the sacred palace, who have always been dominicans. They are inquisitors in many places. The nuns or sisters of this order, owe their foundation to St. DOMINIC himself, who built a monastery at Prouilles, where poor maids might be brought up and supplied with all necessaries for their subsistence. The habit of these religious was a white robe, a tawny mantle, and a black veil. Their founder obliged them to work at certain hours of the day, and particularly to spin yarn and flax to make their own linen. The nuns of this order have 130 houses in Italy, forty-five in France, fifty in Spain, fifteen in Portugal, forty in Germany, and many in Poland, Russia, and other countries. They lie on straw beds, and never eat flesh excepting in sickness; but many monasteries have mitigated this austerity.

DOOR, in architecture, is a contrivance for securing an aperture in a wall, to admit persons to enter and leave a house or apartment.

The proportions of doors are, in general, regulated by those of the human frame. In capacious buildings, they ought always to be larger than in small ones; but they should in none be less than 6½ feet high, so as to allow a tall person to pass though it erect; the width must not be less than three feet.

Architects give the following dimensions for doors: in small edifices, their breadth ought to be 4 or 4½ feet; in those of a middle size, 5 or 6; in large buildings 7 or 8: in chambers of the first description, 3¾, 4¼ or 4 feet; of the second, 4 or 4½ feet; and of the third, 5 or 6; in churches, 7 or 8; and in gates 9, 10, or 12; by these proportions the height of doors may be easily determined; excepting those designed for the gates of cities, which should be only four-fifths of their breadth.

DOREE, (*Zeus faber*) is a fish very much compressed at the sides, with large head, wide mouth, long filaments to the rays of the first dorsal fin, the tail rounded, and a roundish black spot on each side of the body.

This fish is an inhabitant of most seas, and is usually about a foot and half in length; but it is sometimes known to weigh so much as ten or twelve pounds.

Near the coasts of Devonshire and Cornwall, dorées are caught in great numbers both in nets and with lines, and they are principally in season during the months of October, November, and December. Their name is a corruption from the French *jaune dorée*, and signifies golden yellow fish, this being their colour when first taken out of the water.

DOTTEREL (*Charadrius morinellus*,) is a species of plover distinguished by its roundish and obtuse bill and black legs, its breast being rust-coloured, and by having a white line over each eye, and another upon the breast.

These birds seldom weigh more than three or four ounces. About the latter end of April, during the month of May, and part of June, they are found, in flocks of eight or ten together, on the heaths and moors of Cambridgeshire, Lincolnshire, and Derbyshire, and amongst the mountains of Westmoreland and Cumberland. They are also seen on the Wiltshire and Berkshire downs in the months of April and September.

Such is the singularity of manners of these birds that it is possible to catch them even with the hand by a very simple artifice. It was formerly customary for the fowler to proceed in the night with a candle and lantern to the places where he knew the birds to roost. Roused but unalarmed by the light, if he approached with caution they would continue immoveable until he was able to discover them. He would now stretch out one of his arms, which induced the imitative bird to stretch its wing; then a foot which the bird likewise mimicked. This he did alternately until he was sufficiently near to extend and entangle them in his net. There were other contrivances besides this, but the greater facility of killing them by the gun has of late years rendered them all useless.

When dotterels are best in season they are very fat and delicate eating.

DOUGH, is flour fermented with yeast, or leaven, and kneaded into paste.

In some parts of this country, the dough is made by the hand, but in the more populous towns and cities, the process is generally performed with the naked feet; a practice which deserves severe censure, as it may be easily avoided by the introduction of a certain machine, employed for the same purpose in public baking houses. The object of this machine is, to convert a large quantity of flour into dough, and to knead it as completely as may be necessary, with a considerable saving of time and labour.

The machine consists of a frame or wall of wood, 14 palms (about 3½ English feet) high, that supports an axis, 30 palms (7½ feet) long, and 1 1-3 palm (4 inches) thick; to which is joined a large wheel. In this wheel are steps, on which the men tread, turn it with great velocity, and thus impart motion to a cog-wheel that is fixed almost at the extremity of the axis, and acts upon various small pieces of machinery, or *beaters*, which communicate with a strong wooden tub, well hooped with iron. As soon as the whole is tempered with a proper quantity of warm water, the wheel is turned round, by which the dough is expeditiously and completely kneaded. In general, a quarter of an hour is sufficient to make very good dough; but an experienced baker, who superintends the operation, determines whether it is to be continued for a few minutes, more or less, according to circumstances.

Those who think with us, that kneading the dough with naked feet, is a disgusting custom, and ought, without hesitation, to be abolished, will find a more copious description of the Italian machinery above mentioned, as well as a plate representing the whole apparatus, in the third volume of the *Repertory of the Arts and Manufactures*, [mentioned under article BREAD.] These improvements were sanctioned, and originally published, by the Patriotic Society of Milan, in their valuable *Transactions*.

DOVE-TAILING, in carpentry, is the manner of fastening boards together by letting one piece into another, in the form of the tail of a dove. The dove-tail is the strongest of the jointings, because the tenon, or piece of wood which is put into the other, goes widening to the extreme, so that it cannot be drawn out again by reason of the extreme being larger than the hole.

DOWN, the shortest, smoothest, softest, and most delicate feathers of birds, particularly of geese, ducks, and swans, growing on their neck and part of the stomach. Down is a commodity of most countries, but that from the north of Europe is in the most repute. There is also the ostrich's down, otherwise ostrich's hair, used in the manufacture of hats, and coarse white cloth.

To improve the down of geese.

The nature of the food contributes very much to the value of the down, and to the strength of feathers; the particular care taken of geese has no less influence. It has been remarked, that in places where these birds find a great deal of water, they are not so much subject to vermin, and furnish feathers of a better quality.

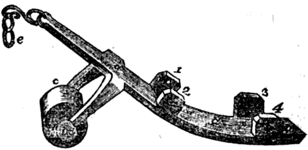
To ascertain the properties of goose down.

There is a sort of maturity, in regard to down, which may be easily discovered, as it then falls of itself; if removed too soon it will not keep, and is liable to be attacked by worms. Lean geese furnish more than those which are fat, and are also more esteemed. Farmers ought never to suffer feathers to be pulled from geese, some time after they are dead, for the purpose of being sold; they generally smell bad, and become matted; none but those plucked from living geese, or which have been just killed, ought to be introduced into commerce. In the latter case the geese must be plucked soon, and in such a manner that the operation may be terminated before they are entirely cold; the feathers are then much better.

DRAG, or Wheel-drag, an implement so constructed as to prevent the accidents which frequently happen to horses, when drawing loaded carts down steep hills or declivities.

In the year 1794, an instrument of this description, upon an improved principle, was invented by Mr. Joseph Kneebone, of Marazion, Cornwall, for which the *Society for the Encouragement of Arts*, &c. in 1795, conferred on him a bounty of twenty guineas.

This simple contrivance is, on the brow of the hill, applied to the near wheel, being fastened to the shaft by a chain, to prevent the wheel from passing over it, in case any great obstacles should occur in the road. It answers the purpose of taking off the increased weight, necessarily thrown on the shaft-horse's back when descending any declivities, so effectually, that the deep ruts, or loose stones, which frequently occur in roads, do not in any degree impede the descent of the cart. Instead of a loaded carriage running on the heels of the shaft-horse when descending hills, the drag, by supporting and elevating the wheel, places it on a level, so as to oblige the horse to draw a small burden. In some instances, it is even necessary to link the chain-horse to the side next the wheel that is dragged: by which means a weak horse may, without any risk or danger, be placed within the shafts. As soon as the cart arrives at the bottom of the hill, the drag is to be taken off, aud secured in the manner hereafter to be described.



Description of the cut of Mr. Joseph Kneebone's *Wheel-drag, for two-wheeled Carriages.*

a, a, a, A piece of wrought iron, curved to the exact form of a cart-wheel, with the thickest part at *b*, on which the weight of the cart rests.

1, 2, 3, 4, are shoulders, that keep the wheel within the drag, and should be about 4 inches high. *c*, is the wheel, made of solid iron, which is nearly as wide as the drag, 7 inches in diameter; runs on its axis at *d*; has a strong shoulder; and, as it projects, resists the sudden jolts of rough roads. *e*, is the chain to be fastened to the near shaft, in order to keep the drag properly under the wheel, which, from being violently jerked, might be apt to pass over the drag, and leave it behind: this is a necessary precaution, though seldom wanted, if the drag be well constructed.

In the shoulders marked 1, 2, are holes, by which the drag is suspended on hooks beneath the tail of the cart, when it is not employed.

This machine is, doubtless, susceptible of many improvements, especially in the size and construction of the wheel. By frequent use, the part to which the greatest pressure is applied, will necessarily wear away, and thus injure the drag: to prevent this accident, it ought to be shod, at first, with a plate of iron, or steel, fixed by means of two holes in its bottom; in which, when necessary, a similar piece may be inserted.

DRAGON'S BLOOD TREE, or Rotang, is a species of cane (*Calamus rotang*) which grows to the height of more than a hundred feet, is about as thick as a man's arm, closely beset with erect prickles; and has at the top a tuft of leaves which are several feet in length, and alternately winged, and of which the leaflets are sword-shaped, and armed with sharp spines.

In consequence of its great length and slender form, this tree, which is usually found in woods near rivers, and in morassy places, is not able to grow entirely upright, but, after having attained the height of five or six yards, depends for support upon other trees, which it sometimes overruns in nearly a horizontal direction, to the extent of sixty or eighty feet. The flowers are produced in upright spikes that separate into long spreading branches, and are succeeded by a red and somewhat egg-shaped fruit, which to the taste is pleasantly acid.

The drug called *Dragon's Blood* is obtained from this fruit, in Japan, Cochin China, Java, and other parts of the East. For this purpose the Japanese expose the fruit to the steam of boiling water. By this operation the external shell is softened, and a resinous fluid is forced out, which is afterwards inclosed in leaves and suspended in the air to dry. In Sumatra the external surface of the fruit is observed to be covered with the resin, which is rubbed off, melted in the sun, and formed into grains or globules; these are folded in leaves, and are considered the purest kind of dragon's blood. In some countries the fruit is boiled in water, and the resin, which floats upon the surface, is skimmed off and subsequently purified, and formed into the requisite shape for sale. An inferior kind of dragon's blood is made up into large masses which contain the membraneous parts of the fruit and other impurities. When this substance is tolerably pure it breaks smooth, and appears internally of a dark red colour, melts readily, and easily catches fire. Its principal use is in medicine. [It gives a red colour to alcohol.—T. C.]

The stem of the rotang furnishes the inhabitants of the countries where it grows with shafts for pikes or spears; and the inner part of the young shoots, when stripped of the bark, is boiled or roasted for food.

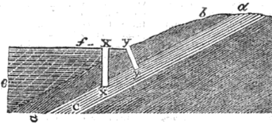
Several other trees produce the red kind of resin called Dragon's Blood.

DRAINING is the art or practice of making artificial channels, for carrying off superfluous moisture or water from wet or marshy lands.

Lands to be drained are usually divided into two classes: 1. *Uplands*, or those which are situated so high, that the water can descend from them, if properly collected and conducted; and, 2. *Fens, marshes*, or those lands which lie so low as to command no fall; have no descent; and some being even below the level of the sea.

1. With regard to *uplands*, it generally happens, that the waters from the springs beneath the soil are obstructed in their course to the neighbouring rivers. These springs originate from the atmospheric moisture; which, being condensed on the summits of hills into water, by the greater coldness of those parts, perforates the different strata of the incumbent soil, where it is of a porous nature; the water continues to descend, sometimes for many miles together, but generally from the nearest eminences, into the adjoining valley, till its course is intercepted by a stratum of clay; where, being collected in considerable quantities, it is forced to work itself a passage through the porous strata of sand, gravel, or rock, that may be above the clay, following the course of these strata, till they approach the surface of the earth, or are interrupted by any obstacle, which causes the water to rise to the surface, and to form springs, bogs, marshes, &c.

At the foot of hills, therefore, where the plain begins to be too moist, some auger-holes should be bored, in order to find the depth of the springs, and consequently the thickness of the upper stratum of the soil. If this be only 4 or 6 feet, a horizontal ditch should be cut along the bottom of the hill, to intercept the water, which ought to be carried off by one or more ditches communicating with the former, and conducting the water thus collected, into the neighbouring rivulet. Farther, as the strata, through which the water descends in forming these springs, have, with a few exceptions, the same inclination as the surface of the hill, the holes should be bored, and the ditch cut, not vertically downwards, as is commonly practised, but perpendicularly to that surface; a method which greatly facilitates the arriving at the second stratum: this will be more evident from the subjoined cut.



a, *b*, is the upper stratum, for instance, of marl; *c*, *d*, is the second stratum, of sand; *e*, *f*, represents the accumulated earth in the valley. It is designed to shew, that, in boring holes through the upper stratum, in order to find that beneath it, they should be formed perpendicularly to the side of the mountain, and not perpendicularly to the horizon, as by the former method the hole *y*, *y*, is rendered much shorter than that marked *x*, *x*.

If, nevertheless, on cutting a ditch five or six feet deep, along the foot of a hill, vertically to the rising plain, the upper stratum be not penetrated, and consequently no water ooze into the bottom of the ditch, it will be expedient to bore other holes at the bed of such ditch, some yards deeper, or till water ascend through them. Where this succeeds, many holes should be made, and the water conducted into the adjacent brook or river; for it will then rise, collect in those trenches six feet below the wet surface of the valley, and thus be carried off, instead of rising up from the lower *wall-springs*, or apertures of the stratum, through the incumbent soil, to the surface of the valley, which is so many feet higher.

This is the method which has been successfully practised, for several years, by Mr. ELKINGTON, who was always guided where to bore by the plants that indicated a moist soil.

These ditches should be made narrower as they descend, by spades of a proportionate size and breadth: but the lowest part ought to be contracted more than any other, so that the shoulders or edges of it may support stones or faggots, in order to cover the whole, at a small expense, without obstructing the currents of water. In many places, hollow bricks, ridge-tiles, or old fragments of plastered floors, may be applied to the same purpose; as they may be substituted for stones or faggots, and at a reduced expense.

Situations, however, frequently occur, where the first stratum of the earth may be too thick to be easily perforated; or where the water, condensed from the atmosphere on the summits of the hills, may work itself a passage between the second and third, or between the third and fourth strata, which form the sides of those hills, from a deficiency of so many of the strata at their summits. Hence the water lies too deep to be retarded in its progress by a ditch or by boring; but, being dammed up by the materials that form the plain of the valley, it ascends through them to the surface, and thus forms boggy or marshy ground. In such cases, the common mode of draining may be successfully employed: it consists in cutting several ditches four or six feet across the bog or morass; and in covering them so that the water may not be obstructed in its passage, but be thus in part collected and conveyed away, though certainly with less advantage than where springs can be intercepted.

Another method of draining is, that of opening trenches or drains, almost annually, by a large plough with two converging coulters, and other appropriate machinery, for the purpose of cutting both sides of a ditch at the same time, and turning out the intervening soil. These large ploughs are still kept in some parishes, and drawn over moist commons, by twelve or twenty horses, so as to form parallel ditches.

An instrument was invented for this purpose by Mr. ADAM SCOTT, of Guildford, Surrey, called by him, *a Mole Plough*, and for which the *Society for the Encouragement of Arts, &c.* in 1797, gave him a bounty of 30 guineas. It consists of a coulter, 15 inches in length, and 2½ in width, to cut the sward. Behind this is applied a horizontal cone of cast iron, 20 inches long, and 2½ in diameter at the base, to the middle of which is fixed an upright bar 2 feet long, and 3½ inches broad, with a sharp edge. If this cone be drawn along moist lands, 6 or 8 inches beneath the turf, either in the spring or in autumn, in several parallel directions, the water will be conveyed away for a considerable space of time, without breaking the surface. With Mr. SCOTT's mole plough, a man and boy with four horses may, with ease, *drain* thirty acres in a day; but, at the lower side of the ground intended to be drained, there should be made an open gripe or ditch, in order to receive the water from those small cavities which are formed by the plough, at the depth of 12 or 14 inches. In very moist lands, or in very wet seasons, if a larger number than six or eight horses be employed, their feet will not sink so deeply into the turf, as each animal will draw less; should, however, the ground be so exceedingly soft as scarcely to support the cattle, that inconvenience may be obviated by fixing to the horse's feet broad wooden shoes, similar to the snow-shoes made use of by the inhabitants of northern climates. The price of this useful plough, when complete, does not exceed 2½ guineas.

In October, 1797, a patent was granted to Mr. HARRY WATTS, of Binley, Warwick, for his invention of an implement or machine for draining land, which appears to be an improvement on Mr SCOTT's mole-plough. The only material difference which subsists between them, is Mr. WATTS's application of a rolling cutter made of cast steel, or cast iron, in the beam of his implement, instead of the common coulter, which, in Mr. SCOTT's plough, is fastened in the usual manner, by wedges. The patentee has likewise added three cutters, which may occasionally be substituted for the rolling cutter or coulter above mentioned. This implement requires from four to eight horses, which number may be increased or diminished, according to the nature of the land, and the depth it is intended to be worked. But, before it is used, Mr. WATTS observes, that the land to be drained should be carefully examined, in order to ascertain the most convenient place for carrying off the water. Hence the lowest end or side of the field must be selected for that purpose. The price of Mr. WATTS's machine, we understand, is not less than 10 guineas.

The last method of draining uplands, of which we shall give an account, is that practised in the county of Berks. It consists in digging a trench 2 feet deep, one foot wide at the top, and 9 inches at the bottom, with a steep descent to a ditch, extending along the bottom of the grounds, and made of a proper width and depth to receive and carry off the water. Within these trenches, is formed a channel, the sides of which are composed of hard white chalk, cut nearly into the size of bricks; the whole is covered with pieces of the same material, and the crevices filled up with the chippings. The mouth of the channel, where the water falls into the ditch, is constructed with brick or flint, as chalk will not bear the frost, to which this part of the work must necessarily be exposed. On the top of the channel is placed a thin coat of wheat-straw, brambles, or any small brush-wood. The passage for the water will be somewhat more than 3 inches. In digging trenches of this kind, the workmen lay the best earth on one side by itself, in order to replace it on the surface when the trenches are again filled up. But, in all cases, where land lies on a declivity, care should be taken, that the drains have an easy and gentle descent, for, if they have too rapid a fall, they are apt to burst, or excavate; and, their protection below being lost, the least pressure from above will consequently destroy the work.

II. With respect to the draining of those *plains* or *morasses*, where no fall can be procured, the water may, in many situations, be collected by cutting a long horizontal ditch above the level of the morass, so as to intercept all the wall-springs; and may then be carried off in wooden troughs, or hollow bricks, above the surface; and, if any water continue to penetrate the morass, it may be conducted to the extremity of the ground, either in open drains, or in covered brick drains.

The draining of low moist lands may also be advantageously effected by a *roller* or *wheel*. This is made of cast-iron, weighs 4 cwt. and is 4 feet in diameter. The cutting edge, or extreme circumference of the wheel, is half an inch thick, which, increasing in thickness towards the nave or centre, will cut a drain half an inch in width at the bottom, 4 inches wide at the top, and about 15 inches deep. This wheel is so placed in a frame, that it may be loaded at pleasure, in order to score out a greater or less depth, according to the resistance of the ground; which being thus cut during the winter, the wheel tracks are either then filled with straw ropes, and lightly covered over, or left to crack wider and deeper, during the succeeding summer; when the fissures should be kept open with twisted straw and bushes, and lightly covered with such porous soil as can be most conveniently procured. Thus hollow drains may be formed upon grass or ley-land, at little expense, and will answer every useful purpose.

The necessity and utility of draining the surface-water from *clay soils*, in wet seasons, is generally acknowledged; but, excellent as the different methods are in the cases before mentioned, they do not appear to be so simple, or so effectual as could be wished in the present. Covered drains frequently fail in producing the desired effect, in consequence of the covering materials being of too close a texture to admit the water to filtrate through them with sufficient freedom. Mole-ploughs, of the best construction, require such a number of horses to draw them, as must necessarily injure the soil, by *poaching* it. Farther, *covered drains* are not only dangerous to full-grown sheep and young lambs, but from the quantity of clay necessarily dug up, and spread over the richer surface-soil, they are also injurious to vegetation. None of the several modes of draining now in use, being subservient to the essential purpose of conducting large quantities of water from a deep soil, we feel satisfaction in communicating the following simple contrivance of Mr. JOHN MIDDLETON, just published in the 22d No. of the "*Commercial and Agricultural Magazine.*" It consists merely in adding a piece of wood to the felly of a common six-inch cart-wheel, to which is prefixed a rim of iron, of a triangular form. The whole expense of this addition does not exceed one guinea. A wheel of this description, when put on the axle of a cart in the usual way, will of course rest on the edge of the triangular rim of iron above alluded to; and, on driving the horses forward, will make a small indent in the ground, merely by its own revolution. But, in order to press it down to the depth of six or eight inches, that side of the cart should be laden with stones, iron, or any other heavy material, until the whole of the rim, as well as the additional piece of wood, and the felly itself, if necessary, sink into the soil. The cart should then be drawn in such a direction that the cutting-wheel may revolve where the drains are intended to be formed. Sometimes it will be necessary to apply the indenting machine to every furrow; but, where the land is level, it should be drawn over it in parallel lines, five or ten yards apart. The wheel on the opposite end of the axle is a common six-inch wheel, which supports only the empty side of the cart, and consequently will not cut the ground.

The advantage of this contrivance, as stated by Mr. MIDDLETON, is, that it makes an indent in the soil sufficient to carry off the water during the ensuing winter, by pressing down the herbage, without destroying it. In the succeeding spring, these drains will be nearly grown up, so that there is no injury done to the grass. He observes, however, that this wheel should be drawn over the ground every year, on the approach of winter: but so easy is its application, that by means of it, and two old horses, one stout boy, or man, may drain from *ten* to *twenty* acres in *eight* hours.

The first object in draining a bog or marsh, is, to discover the lowest spot of dry ground that surrounds it, in order to open on that part the main trench which is to carry off the water: if there be the least appearance of any stream, it should be traced with care; for this will point out the proper spot on which to begin. The main trench, commencing at the lowest part, may be carried to whatever distance it is thought proper; if it begin at the right spot, 10 acres may be detached from the marsh, however extensive, and completely drained; but, if the drainage be not begun where there is a sufficient fall, the labour bestowed will be to no purpose: the main cut or trench should be 10 feet broad in the clear, with a proper slope, to prevent the sides from falling in, and filling it up.

Bogs are divided into two sorts, *black* and *red*. The former are solid, and make excellent fuel for common fires, or for burning lime; but the red bog consists of a loose, porous, fungous mass, which burns badly, and yields no ashes. Hence, in black bogs only, the drains ought to be cut into turfs, dried, carted, and piled.

As the main canal advances, small ones may be conducted into it on either side, inclosing such spots of ground as are intended to be improved. No certain rule can be laid down for the depth of drains; yet we apprehend the prevailing practice of cutting them down to the solid ground beneath the bog, is founded on the erroneous principles that such depth is sufficient as will leave the surface dry. Numerous drains, however, being always useful and necessary, the spots inclosed ought not to contain more than five acres; but in such space it is requisite that several cross-cuts be made, which should be 4 feet broad at the top, and 3 feet deep. A whole year will be requisite to complete these drains; and, in the ensuing spring, it will be necessary to open, deepen, and clear them of the adventitious boggy matter; a work which should be occasionally renewed. The second year may be employed in extending the main trench; in taking in fresh inclosures by new lateral cuts; and in draining these by means of small transverse drains. Although this annual deepening and clearing of marshy grounds be attended with great labour and expense, yet the operation is thus progressively completed, and in succeeding years both trouble and costs will be gradually diminished, in proportion as the bog subsides.

As soon as the drains have rendered the marshes sufficiently firm for oxen to walk on them, the heaviest rollers that can be procured should be employed, to act by repeated pressure. Indeed, without a considerable degree of such pressure, during the first year, no bog can be effectually consolidated. An alternate draining and rolling, annually (the drains being still kept open), would, probably, contribute much to the destruction of weeds. Previous to rolling in the spring, it has been strongly recommended to sow every kind of grass-seeds, indiscriminately, such as ray-grass, hay-seed, clover, &c.

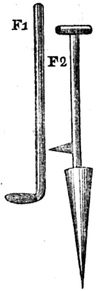
An instance of uncommon and successful industry occurs in the 18th vol. of the "*Transactions of the Society for the Encouragement of Arts*," &c. which in the year 1800, conferred a gold medal on JOHN MOREHOUSE, Esq. of Brownslade, in the county of Pembroke, for improving 274 acres of waste moorlands, which were formerly a common, and so completely inundated as to be of no value whatever.

Before we conclude this subject, we think it necessary to give some account of stone drains, which are calculated for soils where the common methods of draining cannot be adopted. Such drains ought to be cut 10 or 12 inches wide, with perpendicular sides; and flat stones should be so placed as to leave a water-course at the bottom, by setting two stones triangularly to meet at the points. Or, the bottom may be covered with a flat stone, and three others placed upright, and the water left to work itself a passage between them. In either case, the cavity of the drain ought to be filled nearly up to the top with loose stones: screened or washed gravel, where it is found in greater abundance, has been successfully substituted. Those pebbles, however, which are often found on the seashores, are well adapted for filling drains; as, being smooth, and generally round, the water flows through them more freely.

The principal drains ought to be 3 feet deep, and 18 inches in width; the bottom and top should be laid with flagstones; the sides built up to a sufficient height with common stones; and the whole covered with sods of turf, but the grassy sides downwards; these again are to be overspread with earth, sufficient to admit the plough. The smaller drains are, in general, to be conducted at an acute angle into the main trenches.

Lastly, *sod* or *earth-drains* are usually dug two feet deep with a spade, when the soil is taken out by an instrument, or scoop, about four inches wide, and the drain covered with the sods first dug out, if the ground be firm enough to support them; or, some black thorns are put in, in order to bear the weight of the sods. Those drains which have the smallest passage for the water at the bottom, are reputed to be the most durable, as the force of the water has been found sufficient to clear away any small obstacles accidentally obstructing its course.

Common earth-drains are sometimes dug two or three spits deep, with a broad spade, the bottom is taken out with a narrow one, and filled with stones. Sometimes a furrow is drawn with a plough, and cleared by a common spade: the draining instrument, Fig. 1, in the annexed cut, is then introduced to the depth of 18 inches from the surface; and, after taking out the loose mould with the scoop, Fig. 2, black-thorn bushes, or heath, which is still better, are carefully laid along the bottom, covered with strong wheat-straw, twisted to the thickness of a man's leg; and the whole is then carefully closed in.



Hollow drains, without stones, have been tried on stiff lands: they are made narrow at the bottom, and covered half way up with sods or square pieces of the surface-sward, resting on ledges cut for that purpose.

It is much to be lamented, that we possess, in this cold climate, no grain similar to *rice*, that would grow in watery grounds, which cannot be drained, nor indeed any esculent roots or foliage, except water-cresses. In such situations, some plants may perhaps be cultivated with profit to the proprietor, as the *Festuca fluitans*, or Floating-Fescue; *Callitriche*, or Star-grass, or Star-wort, to which may be added the *Orchis*, for the purpose of making salep, by drying the peeled roots in an oven. If these plants should not completely succeed, other vegetables of quick growth may be raised for manures, such as the *Typha*, or Cat's tail; the *Caltha*, or Marsh-marigold, &c. which should be mown twice a year, while they are young, and abound with saccharine and mucilaginous matter, ready to pass into fermentation.

A peculiar method of draining land with *chalk*, as a substitute for stones, has lately been practised in Yorkshire, with considerable success. It consists merely in cutting the trenches in the usual manner, and filling them with pieces of chalk; over which is laid a thick stratum of evergreen-boughs, that are covered with the sod or earth. The extremities of the main drains are arched to a short distance with brick-work: because the frost is apt to pulverise the chalk, and consequently the drain will be injured. The principal advantage thence derived is, that *no moss will grow on the chalk*, whereas stone-drains are frequently obstructed by its growth: hence we are induced to recommend draining with chalk, to the attention of those farmers who have an opportunity of procuring that article, at a moderate expense.

In the year 1792, the *Society for the Encouragement of Arts*, &c. awarded their silver medal to Mr. John Wedge, for his exertions in draining land. The limits of this article not permitting us to analyse Mr. W's valuable communication, which is inserted in the 10th vol. of the Society's *Transactions*, &c. we shall only observe, that the chief advantage consists in *boring*, or digging holes below the bottom of the trench; a practice which, in some instances, is attended with the most beneficial effects; though it is not absolutely necessary, in ordinary cases.

A short but interesting "*Sketch of the Drainage and Improvement of a Marsh*," in the county of Cornwall, by Mr Richard Moyle, occurs in the second volume of "*Communications to the Board of Agriculture*." The bog contained 36 statute acres, which had from time immemorial been covered two or three feet deep with water; and which, during spring-tides, were overflowed by the sea, from a river, taking its course through the land. As the low situation of the marsh rendered it impracticable to drain the bog by the aid of such river, recourse was had to a wooden pipe, furnished with valves, and connected with the shore at the part called *Half-ebb*. This expedient was attended with complete success: the soil was pared and burnt; large quantities of clay and other manure were carted; and, after persevering in these exertions for five years, the whole of the land was "quite alive;" so that every kind of vegetables flourished with great luxuriance. For a more detailed account of this remarkable improvement the reader will consult the work above quoted.

In the 19th vol. of the "*Transactions of the Society for the Encouragement of Arts*," &c we meet with a description of a Drain-plough, constructed according to the plan of the patriotic Duke of Bridgewater; and of which the annexed plate and following description will convey an accurate idea.

A, B, is the beam of the plough.

C, D, are the handles.

E, the share, or sock.

F, the coulter, or first cutter of the sod, which is fixed to the share.

G, is the other coulter, or second cutter, which separates the sod from the land, and forwards it through the open space between F and G. This coulter is connected both with the share and with the beam.

H, I, the sheath of the plough.

K, the bridle or muzzle, to which the *swingle-tree* is fitted.

L, M, are two cast iron wheels, that may be raised or lowered by screws at N, pressing on the flat irons O, O; to which the axis of each wheel is fastened. These wheels regulate the depth to which the share is designed to penetrate the soil.

P, is the chain with an iron pin, for moving the screws at O.

Six horses will be necessary to draw this plough, in clay-soils, which have never been drained; every succeeding year, the implement must be drawn through the same gutters; when four horses will be sufficient. In stiff, flat lands, this drain-plough cannot cut the ground too deeply; but if it be employed on a declivity five inches will, in general, be a sufficient depth. In soft, light soils, however, the plough should be directed as deep as possible; because the sides are apt to crumble into the gutters. The best time for draining land is in autumn, about Michaelmas; or immediately after the grass is eaten off; and the whole operation ought to be completed between that season and Christmas.

It frequently happens that, notwithstanding all the labour and expense which the industrious cultivator may bestow on the construction of drains, his lands become, in the course of time, soft and wet, so that they gradually return to their former state. This unfavourable change is often occasioned by the *Equisetum palustre*, or Marsh Horsetail, a plant growing on swampy ground, which has been found vegetating *within* the drains, to a very considerable extent, and thus at first intercepting or obstructing the course of the water, then gradually weakening the current, and at length wholly choking up this drain.

Sir Joseph Banks has communicated to the *Board of Agriculture* the following remarks on the effects of the above plant on drains.

At the Duke of Bedford's seat, at Wooburn, some bogs drained by under-drains, made at great expense, appeared at first perfectly dry, but have since been found to grow by degrees less so. On examination, these drains were found more or less choked by a plant vegetating within them, and forming both stems and roots, the whole several yards in length, intercepting the course of the water, weakening the current by degrees, and at last, wholly choking up the drain. This plant is the *equisetum palustre*, a weed common in moorish and swampy ground, but little noticed by naturalists. Its root, or rather its stem under ground, is a yard or more in length, and in size, like packthread: from this, a root of twice the size of the stem runs horizontally in the ground, taking its origin from a lower root, which strikes downward perpendicularly to a depth, Sir J. says, (which he has been able to trace) as thick as a small finger. This root forms in some places, beds which occupy a large portion of the more solid parts of a peaty bog, as may be seen in some parts of the banks of the Duke's open drains. As the bud, by which the plant appears to renew itself in spring, is situated on the horizontal root, a yard or more in depth, the shoot must in its progress upwards, be liable to meet with under-drains, and penetrate into them, through the openings left for the passage of the water. When once entered, nature has given the plant powers of piercing the soil upwards, and to enable it to live in the atmosphere of a drain. The evil, if known, Sir Joseph thinks, may be cured by casting the under-drains into open ones.

Those who wish to acquire more minute information on this subject, we must refer to Dr. Anderson's excellent "*Practical Treatise on draining bogs and swampy grounds,*" and to Mr Johnstone's "*Account of the most approved Mode of Draining Land,*" in which it is amply investigated. See also Ponds, with a plate.

DRAWBACK, in commerce, certain duties, either of the customs or of the excise, allowed upon the exportation of some of our own manufactures; or upon certain foreign merchandise, that have paid duty on importation. Drawbacks are paid by the collector of the customs at the port where the goods are exported, on producing a debenture authenticated by the proper officers as the voucher for the payment. Drawbacks prevent the natural tendency of capitals from being deranged by taxation. When the duties paid on the importation of sugar, tobacco, &c. are retured on their exportation, the trade in those articles is only replaced on the situation it would have been in, if the articles had not been taxed. A still more equitable arrangement than that of drawbacks, is to allow the merchant, who imports any commodity which he may probably wish to export again, to deposit it in the government warehouses, giving bond for the payment of duties, should he dispose of it for home consumption. This is called "bonding," and is allowed to some extent.

DRAWING, the art of representing the appearances of objects upon a flat surface, by means of an outline which describes their form, and shadow which shews them round, prominent, near, distant, &c. The learner cannot be too strongly recommended to encounter the difficulty of using only a free style; for, though the pencil may thus seem much less manageable, than if handled in a cramped manner, this obstacle is as quickly overcome as any other, and the consequent advantages great and lasting. In acquiring the command of the pencil, and a knowledge of the forms of bodies, large and distinct examples should be copied. In shadowing with India-ink, &c. large hair pencils should be used, which, if good, have as fine a point as any other, and water should never be spared. What we have drawn large, we can draw small; but what we have drawn only small, we shall find ourselves very much at a loss to describe on a larger scale. We should copy both nature and good imitations of it, and improve ourselves by both: for though drawing is as it were a universal faculty, and nature a universal model, yet it avails us much to know how others have imitated it. We are free to improve upon former methods, but it is well that we should know them: it is necessary, meanwhile, that we should be acquainted with nature ourselves, that we may discover their imperfections or be truly sensible of their merits. Besides the knowledge of simple outline, the more scientific power of delineating that which, independently of shadow, is necessary to describe projection, must be attained. This, which is always dependent on the principles of "perspective," is, in representations of animals and many other objects, called "foreshortening." See PERSPECTIVE.

DRAW-NET, a kind of net for taking the larger species of wild fowl: it ought to be made of the best packthread, with wide meshes; the whole should be about two fathoms in depth, and six in length; verged on either side with a very strong cord, and stretched at each end on long poles.

Draw-nets must be spread smooth and flat on the ground, and strewed over with sedge, grass, &c. to conceal them from the fowl. The sportsman should likewise conceal himself in an arbour covered with the boughs of trees, grass, fern, or other vegetables, in order to prevent his being discovered. See also BIRD-CATCHING.

DREAMS have been described as the imaginations, fancies, or reveries of a sleeping man, and they are said to be deducible from the three following causes: 1. The impressions and ideas lately received, and particularly those of the preceding day. 2. The state of the body, particularly the stomach and brain; and, 3. Association. That dreams are, in part, deducible from the impressions and ideas of the preceding day, appears from the frequent recurrence of these, especially of the visible ones in our dreams; in general, ideas that have not affected the mind for some days, recur in dreams only from the second and third causes. That the state of the body affects our dreams is evident from the dreams of the sick and of those who labour under indigestions, spasms and flatulencies: and a little observation will shew that we are carried on from one thing to another in our dreams partly by association. In proof of what we have advanced we may observe, 1st. That the scenes which present themselves in dreams are taken to be real; and we suppose ourselves present and actually hearing and seeing what passes, which is occasioned, by there being no other reality to oppose to the ideas which offer themselves, whereas in the common fictions of the fancy, while we are awake, there is always a set of real external objects, striking some of our senses and precluding a like mistake there. Again, the trains of visible ideas which occur in dreams are far more vivid than common visible ideas, and may therefore be more easily taken for actual impressions. 2dly, there is a great wildness in our dreams; for the brain during sleep is in a state so different from that in which the usual associations were formed, that they can by no means take place during vigilance. 3dly. We do not take notice of, or are offended at any inconsistencies, but pass on from one to another. For the associations which should lead us thus to take notice and be offended, are, as it were, asleep; the bodily causes, also hurrying us on to other and new trains successively. But if the bodily state be such as favours ideas of anxiety and perplexity, then the inconsistency and apparent impossibility occurring in dreams are apt to give great disturbance and uneasiness. 4thly. It is common in dreams for persons to appear to themselves to be transferred from one place to another, by a kind of sailing or flying motion. This arises from the change of the apparent magnitude and position of the images excited in the brain; this change being such as a change of distance and position in ourselves would have occasioned. 5thly. The dreams which are presented in the first part of the night are for the most part much more confused, irregular and difficult to be remembered than those which we dream towards the morning, and these last are often rational to a considerable degree, and regulated according to the usual course of our associations. For the brain begins then to approach to the state of vigilance and that in which the usual associations were formed and cemented. However association has some power in wild and inconsistent dreams.

DRIFT, in mining, a passage cut out under the earth, betwixt shaft and shaft, or turn and turn; or a passage or way wrought under the earth, to the end of a meer of ground, or part of a meer.

DRIFT SAIL, a sail used under water, veered out right a-head by sheets, as other sails are. It serves to keep the ship's head right upon the sea in a storm, and to hinder her driving too fast in a current.

DRILL, in mechanics, a small instrument for making such holes as punches will not conveniently serve for. Drills are of various sizes, and are chiefly used by smiths and turners.

DRILLING, in husbandry, a method of sowing grain or seed of any kind, so that it may be deposited in the ground at an uniform depth; a circumstance of the utmost importance to the production of healthy and vigorous plants.

This method differs from the old, or broad-cast husbandry, which is performed by sowing the grain, or seed, with the hand; whereas, the new practice is effected by one of the most useful machines ever invented, and called a *drill-plough*. It was originally introduced into this country about sixty years since, and at first violently opposed as an useless innovation, till it was proved, by repeated experiments, to be indisputably the best most mode of sowing hitherto contrived. See BROAD-CAST.

By the broad-cast system of culture, the land is often sown in bad tilth, the seed is always scattered at random, and sometimes by very unskilful hands. In drilling, the ground must be in good order; and the seed set in trenches regularly drawn, all being nearly of an equal depth, which is adapted to the nature of each particular kind of seed. These seeds are also distributed at proper distances; and, by being equally and speedily covered, are most effectually protected from vermin, and other accidental injury. Farther, in consequence of the broad-cast practice, the seed falls in many places too thick, in others too thin; and, being imperfectly covered, part of it is devoured by vermin which follow the sower; the remainder is exposed to rain or frost, or to heats, either of which are very hurtful. When harrowed in, a considerable portion of the seed is so deeply buried in the soil, that if the latter be wet, it putrifies before it can vegetate.

Besides, when corn is thus sown, the crop will not admit of being touched afterwards, because its growth is irregular. The soil cannot be broken in order to afford it more nourishment; nor can even the weeds be destroyed without much damage and inconvenience. On the contrary, in the drill-husbandry, the intervals between the rows, whether double or single, may be horse-hoed; and nourishment may thus be repeatedly given to the plants, and the weeds almost totally extirpated. Drilling, however, is not calculated for *every* soil; yet as there are but few situations, in which the broad-cast method is preferable to it, they ought not by any means to impede the more general introduction of the former.

The drill-husbandry is said to be attended with many disadvantages: namely, 1. That it is very difficult to procure the persons who are acquainted with the use of the drill-plough, or its proper management, when on the soil. 2. That the earth requires to be well prepared to admit of it. 3. That the crop is too thinly sown by it. 4. That drilled crops are harvested later than broadcast ones. 5. That clover does not succeed, when cultivated according to the drill-husbandry. 6. That oats produce rank and coarse straw, which does not afford wholesome food for cattle.

These objections appear formidable, and it must be allowed, that no person can acquire a thorough knowledge of the drill-husbandry in one season. It is nevertheless untrue, that the seed is too thinly sown; for, though the quantity required is nearly one half less (which is consequently saved), yet the crops of drilled wheat are, in general, so much more valuable than those of broad-cast, whether we consider the quantity, quality, or weight of the grain, that the inferiority of the latter is evident to every impartial observer. This reason is likewise a sufficient answer to the objection alleged against the expense of horse-hoeing, which eradicates almost every weed, even where hand-hoeing is impracticable: and consequently in a very considerable degree promotes vegetation.

To this, we may add, that by drilling, the seed grows more regularly and vigorously; and that though the crops are harvested later than broad-cast ones, yet they are *gotten in* with less expense and with greater safety, while the soil is left in a better state for future crops.

Such are the advantages and disadvantages attending the drill-husbandry, which we have endeavoured fairly to state: after these decisive proofs, no rational agriculturist will hesitate to pronounce in favour of the new system.

That useful instrument the *drill-plough*, was first introduced in this country by the ingenious JETHRO TULL, in the beginning of the last century. Since that period, various other machines, or drill-ploughs, have been invented by different persons, of which we shall mention the principal.

One of the earliest implements of this description, is the *hand-drill*, which is chiefly employed in the low-lands of Scotland, where it was also invented. It is pushed along by two handles, in a manner similar to wheel-barrows, and sows one row at a time. The principal part of this machine is a wheel, about 22 inches in diameter, and made of solid deal, upon the axle of which is fixed a notched roller 2¾ inches in diameter, and 2 inches long, that turns the fore part of the drill-box. The quantity of seed intended to be sown, is regulated by a slider, which moves up and down in the fore-part of the box, by an adjusting screw fixed at the top; and has a strong brush, that projects from its lower end, and sweeps upon the notched roller. There is also a sluice, or slider, which lies flat on the bottom, on the inside of the drill-box, and juts out between the two handles of the drill, so as to be within the reach of the person guiding it; who, by pushing the slide forwards, completely covers the notched roller, and prevents any of the seed from being scattered, while the drill is turning at the end of the ridges With this implement a woman, or boy, is able to drill from 2 to 2½ acres in a day; the rows being at the distance of 20 inches.

The next contrivance, is that of the ingenious Mr. ARTHUR YOUNG, whose indefatigable labours in promoting agriculture, are too well known to require our encomium. In the common drill-ploughs, there are generally two or three barrels, with corresponding hoppers, or receptacles for seed, through which it is committed to the ground. Such an arrangement renders them necessarily complex; and to obviate the defect resulting from it, Mr. YOUNG has two divisions in the barrel, and two corresponding ones in the hopper, which are more simple, and doubtless preferable to moveable boards. In his drill-plough the whole machinery is fixed, yet he sows with it single rows at any distance, double ones at two feet, or three rows at one foot; relinquishing the other powers of mechanism, to render the plough in all its parts stronger, and more steady. It is likewise calculated for the stiffest soil; and Mr. YOUNG adds, that it will even deposit seed in drills cut through a clay field, without any previous ploughing. For a more detailed account of this excellent machine, we refer our readers to the 3d vol. of "*Annals of Agriculture,*" p. 240, where it is fully described and illustrated with an engraving. The expense of this implement, when complete, is about seven guineas and a half, if made of iron; if of wood, it may be estimated at four.

Dr. WILLICH describes and represents the Rev. Mr. COOKE's drill machinery, but acknowledges that it is too complicated. It was intended to sow wheat, but the late editor, Dr. MEASE, has been informed that it is but little used even in England, where it was invented. In this country, it certainly would not be used. A model of the pondrous machine, was imported some years since, by the *Agricultural Society of Philadelphia*, and no doubt is still to be found. [Dr. MEASE was misinformed. —T. C.]

Fig. 2.

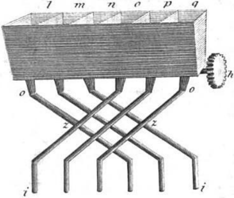


Fig. 4

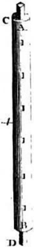


Fig. 3

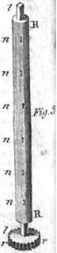
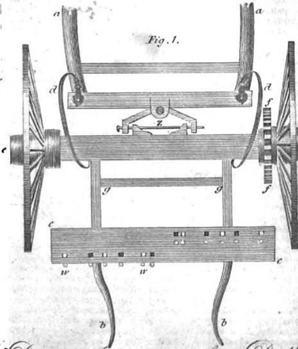


Fig. 1.



Dr. Darwin's Improvements of the Drill-plough

Shallis sc

UNIV.

Under the article TURNIP, a convenient and very simple drill will be described, which may be used for any kind of seeds, by merely changing the seed-box.

Description of the Plates representing Dr. DARWIN'S *Improvement of the Drill-Plough.*

Plate I. *Fig.* 1, *a, a*, are the shafts for the horse, fixed to the centre of the axle-tree, by a simple universal joint at *z*, from which, if the horse move in an oblique course, either spontaneously, or designedly, to avoid trampling the rows of corn, in hoeing, the person guiding the plough behind, may keep the coulters in any direction at pleasure: *b, b*, are shafts or handles behind, for the man who attends the drill, coulters, or hoes: these handles are applied to the axle-tree before, and have a transverse piece about six inches from the latter at *g, g*, in order to support the seed-box (Fig. 2). At the distance of about one foot behind this, there is another cross piece at *c, c*, called the coulter-beam, which is about 4 feet 2 inches long, 6 inches wide, and 2 inches thick: it is perforated with two sets of square holes, each set consisting of six, to receive the coulters in drill ploughing, and the hoes in horse hoeing.

The light square holes are 9 inches distant, and are designed to receive the coulters, or hoes in the cultivation of wheat, the rows of which are to be 9 inches apart: the six dark square holes are 7 inches from each other, for the reception of the coulters or hoes in the cultivation of barley, the rows of which are to be at the distance of only 7 inches. This coulter-beam has likewise 6 circular holes at one end, and 6 round iron staples fixed into the edge of the other part of it: into these are inserted the ends of the tin flues, which intersect each other, and convey the seed from the bottom of the box into the drills or furrows, when the coulters are properly arranged in the square holes. The person guiding the machine can raise these coulters, or hoes, out of the ground, when passing to or from the field, or in turning at the end of the land; and may thus suspend them on the iron springs *d, d*, which at the same time fix the shafts to the axle-tree, so that the wheels will follow in a similar direction with the horse. *e, e*, are wheels, four feet in diameter; upon the nave of one of which is a cast-iron wheel at *f, f*, to turn the axis of the seed-box, which has a similar wheel but only one-fourth of its diameter, so that the axis of the seed-box revolves four times to one revolution of the wheel.

Fig. 2, is the seed-box, consisting of boards about one inch thick, 48 inches in length within, 12 in depth, of a similar width at the top, and six inches wide at the bottom. It is divided into six compartments for the reception of grain, and ought to have a cover with hinges, to exclude the rain. This box is to be placed partly over, and partly before the axle-tree of the machine, as delineated at *g, g*, in Fig. 1. Beneath the seed-box passes a wooden cylinder at *h, h*, the circumference of which is excavated for the reception of grain from the six cells marked *l, m, n, o, p, q*; and for conveying it to the six oblique tin flues, *i, i*, which intersect each other, as represented in Plate I. Fig. 2. By this reciprocal crossing, the seed-flues are designed to increase the length of the inclined surface on which the seed descends, in order, that, if six or eight grains be delivered at the same time, they may so separate by their friction when descending, that they cannot be sown together on the same spot, which might occasion tussocks of corn.

As these seed-flues intersect each other before they pass through the coulter-beam at *c, c*, (Plate I. Fig. 1.), it became necessary to make 3 of the circular holes, at one end of the coulter-beam, more backward than those at the other; and, therefore to use iron staples or rings at one end, instead of perforations, as at *w, w*, (Fig. 1.) These tin flues deliver the seed into the small furrows, or drills, which are made by the coulters before them. The seed-flues have a joint at *z, z*, where one part of the tin tubes slides into the other part, by which means the former can be occasionally shortened or lengthened, in order to adapt them to the coulters, when placed 7 inches apart, for sowing barley; or, at the distance of 9 inches, for sowing wheat. In the bottom of this seed box are 6 holes, one in each compartment, for conveying the corn into the excavations of the cylinder, revolving beneath them. These holes are provided, on the descending side, as the cylinder revolves, with a strong brush of bristles, about ¾ of an inch in length, which press hard on the tin cylinder. The holes in the bottom of the seed-box, on the ascending side of the revolving cylinder, are furnished with a piece of strong leather (such as is used for the soles of shoes,) which rubs upon that side of the cylinder; by which means the corn, of whatever kind, is exactly delivered, while the axis is revolving, without a single grain being cut, or bruised.

Fig. 3, is the iron axis, and wooden cylinder beneath the seed-box. An iron bar is first made, about 4 feet 6 inches long, and one inch square, the weight of which ought to be about 15 lbs. It is covered with wood, so as to form a cylinder 4 feet in length, and 2 inches in diameter, represented at *r*, *r*, in this figure. The use of the iron bar in the centre of the wood, is to prevent it from warping, a circumstance of great importance. This wooden cylinder passes beneath the seed-box, and has a cast-iron cog-wheel at one end of its axis, as at *r*, *r*, which is one-fourth of the diameter of the correspondent cast-iron wheel, fixed on the nave of the carriage-wheel, as in fig. 1, *f*, *f*, so that the axis of the seed-box revolves 4 times during one revolution of the carriage wheels.

In the circumference of this wooden cylinder are excavated four lines of holes, consisting of six in each line, as at *n*,*n*,*n*,*n*,*n*,*n*. A similar line of excavations is made opposite to these, on the other side of the cylinder, and between these are two other rows of holes, amounting in the whole to twenty-four excavations in the wooden part of the axis beneath the seed-box, for the purpose of receiving and conveying the corn from the seed-cells into the flues *o*,*o*,*i*,*i*, (Fig. 2) while the axis is revolving: in which respect this improvement of Dr. **Darwin** bears some analogy to the original design of the celebrated Mr. **Tull**.

These excavations are one inch in length, half an inch in width, and three-eighths of an inch in depth, which dimensions are too large for any seeds employed at present in large quantities, except beans; but which may be contracted to any dimensions required, by moving the cylinder over the wooden one, as will be immediately explained.

Fig. 4, A, B, represents a tin cylinder one inch longer within, than the wooden cylinder on the iron axis at Fig. 3: it is two inches in diameter within, so as exactly to fit the wooden cylinder, which may slide within it about an inch backwards and forwards. C, D, are two square sockets of tin, fixed on the ends of the tin cylinder to fit on the square part of the iron axis, passing through the wooden cylinder at *l*,*l*, Fig. 3, on which they slide one inch, as before.

The following directions for perforating the holes, both in the tin and wooden cylinders, which are mutually to correspond, Dr **Darwin** recommends to be strictly attended to.

1. When the tin cylinder is soldered longitudinally, and one end of it is thus fixed, as at A, six holes ought to be made through it, lengthwise, on its four opposite sides; each hole must be exactly one half of an inch in width, and 5-8ths of an inch in length, which should be parallel to that of the cylinder. The centre of the first of these holes ought to be five inches distant from the closed end A; and that of the second hole, eight inches apart from the centre of the first; and the others in the same proportion, till six holes are made longitudinally along the cylinder. Another line of six similar holes is then to be made on the opposite side of the cylinder; and after that, two other such lines between the former; the number of holes amounting in the whole to 24, the dimensions of all which should be exactly observed, as well as their distances.

2. The wooden cylinder, fixed on the axis, is now to be introduced into that of tin, so as to leave the exact space of one inch void, at the closed end A; when the size of all these apertures through the tin cylinder (each of which is exactly half an inch in width, and 5-8ths of an inch in length), should be carefully marked with a fine point on the wooden cylinder, which ought not to be previously excavated.

3. The 24 holes, thus marked on the wooden cylinder, are now to be excavated precisely 3-8ths of an inch in depth, to which are to be added 3-8ths of an inch at that end of each of them which is nearest to A; so that, when the wooden cylinder is again replaced in the tin cylinder as before, with one inch of void space at its closed extremity, the excavations in the former will be 3-8ths of an inch longer than the perforations over them in the latter. These excavations in the wooden cylinder should, likewise, be somewhat narrower at the bottom, effectually to prevent any of the grain from sticking in them, while revolving.

4. An iron screw, about three inches in length, with a square head for the reception of a screw-driver, should be passed through the end A, of the tin cylinder on one side of the axis, as at C, in Fig. 4. The screwing part of this

must lie in a hollow groove of the wooden cylinder, and be received into a nut, or female screw, fixed to the same cylinder. The head of the screw, passing through the end A, of the tin cylinder at C, should have a shoulder within the tin cylinder, to prevent it from penetrating through the end of it. A brass ring should also be put over the square end of the screw, on the outside of the tin cylinder, through which end a pin ought to pass, in order to keep the ring steady. Thus, when the square head is turned by the screw-driver, it gradually removes the tin cylinder one inch backwards and forwards on that of wood; so as either to press the end A of the tin cylinder into contact with that of the wooden cylinder within it, or to remove it to the distance of one inch, and leave a void space at the end A.

5. The ends of all the holes of the tin cylinder are next to be enlarged, by slitting the tin 3-8ths of an inch towards A, on each side of the hole; that part, however, of the tin included between these two slits (which will be half an inch wide, and 3-8ths of an inch in length, with respect to the cylinder) is not to be cut out, but bent down into the excavations of the wooden cylinder beneath, so as to lie against that end which is nearest to it. But, before these pieces of tin are bent down, as just described, they should be filed somewhat smaller at the projecting than at the other end: because the excavations of the wooden cylinder are to be rather narrower at the bottom than at the top; and these pieces of tin, when bent down, ought to fit them exactly.

Lastly, when all these holes are thus enlarged, and the bits of tin filed somewhat narrow at their projecting ends, and then bent down into the excavations of the wooden cylinder, the other end of the tin cylinder, with its square socket, may be soldered on. Thus, when the end of the tin cylinder, at A, is pressed forwards upon the wooden one towards B, by turning the screw at C, above described, all the excavations of the wooden cylinder will be gradually lessened, and at length entirely closed; by which means they may be adapted for the reception and delivering of seeds of any size, from horse-beans and peas to wheat, barley, and turnip seed, with the utmost accuracy, so as to sow 4, 5, or 6 pecks per acre, or more or less at the pleasure of the cultivator, merely by turning the screw a few revolutions in either direction.

In farther illustration of these principles, or directions, Dr. **Darwin** observes:

1. That in constructing tin and wooden cylinders beneath the seed-box, another small improvement may become necessary in sowing very small seeds, namely, when the screw at the end A, is turned so as to contract all the excavations of the wooden cylinder, its surface will become bare for the space of one inch from the end of each excavation towards the end B, (Plate I. Fig. 4) without being covered by the tin cylinder. On these exposed parts, which will be one inch long, and half an inch wide, some seeds may accidentally stick, and evade the brushes which are to prevent them from passing while the cylinders revolve. To remedy this inconvenience, when the wooden cylinder is placed within the tin one, in such a direction that all the holes are completely open, Dr. **Darwin** recommends a piece of the tin cylinder, about an inch and an half in length, and half an inch in width, to be cut out from the extremity of each hole next to the end B, and such piece to be fixed by a few sprigs on the wooden cylinder, exactly in the same place it covered previously to its being cut out of the tin one; by which means, when the tin cylinder is afterwards pushed forwards, by turning the screw at its end, so as to contract the excavations of the wooden cylinder beneath, its bare parts will be an inch and a half distant from the extremities of the excavations next to the end B; and thus will not pass under the brushes: consequently no small seeds can be lodged in them.

2. Some kind of iron staple ought to be fixed on the outside, at each end of the seed-box, to catch hold of the two springs at *d*, *d*, (Plate I. Fig. 1) when the hinder part of the carriage is elevated by the man guiding it, in order to suspend the coulters out of the ground, and to connect the hinder part of the machine with the shafts before: so that when turning at the ends of the lands, or passing to or from the field, the wheels may not deviate from the joint *z*, at the centre of the axle-tree, but may follow in the same line as the shafts.

3. The seed-box should likewise be supported on erect iron pins, passing through staples of that material; with a lever under the end of it, next to the wheel *r*, *r*, (Plate I. Fig. 3) in order to lift easily that end of the seed-box, about an inch high, and to raise the teeth of the iron cog-wheel on its axis out of

the teeth of the correspondent iron one, on the nave of the carriage wheel.

4. The construction of the coulters which make the drills, and of the rakes by which they are filled after the seed is deposited, and also of the hoes, are not delineated; as they resemble those employed by persons practising the drill husbandry, and which we have already described, when treating of Mr. **Cooke's** patent machine.

5. When the lower ends of the seed-flues are placed through the holes in the coulter-beam (Plate I Fig. 1) at the distance of 9 inches from each other, the rows of wheat or beans will be 9 inches apart: hence, as the wheels of the carriage are four feet in diameter, and therefore move about 12 feet at every revolution: and, as there are 4 excavations round the axis of the seed-box, which revolve 4 times to one revolution of the carriage-wheels, consequently the seeds contained in the excavations of the cylinder beneath the seed-box, will be sown at 9 inches distance in each drill or furrow, while the plough is proceeding.

6. By Mr. **Cooke's** drill-plough, the quantity of seed sown on an acre is 6 or 7 pecks, that is, about half the quantity used in broad-cast sowing. If the wheat be exactly deposited in the drill, Dr. **Darwin** is of opinion that one bushel will be fully sufficient for an acre, as the rows are nine inches apart from each other: for then 8 or 9 grains would be dispersed in every nine inches of the drill furrow; namely, in every square of 9 inches surface of the land so cultivated. This may be more clearly ascertained by the following data: Mr. **Charles Miller**, in the "*Philosophical Transactions*," vol. lviii. has calculated the number of grains in a bushel of wheat to amount to 620,000; Mr. **Swanwick**, of Derby, has lately computed them at 645,000; Dr. **Darwin**, therefore, concludes that a bushel, on an average, contains 635,000 grains of wheat. A statute acre comprises 4,840 square yards, each of which contains 16 squares of 9 inches; if 4,840 be multiplied by 16, the produce will be 77,440, which is the number of squares of 9 inches in such an acre. If 635,000 grains in a bushel be divided by 77,440, (the number of squares of 9 inches in an acre) the quotient will shew, that somewhat more than 8 grains of wheat will thus be deposited in every 9 inches of the drills.

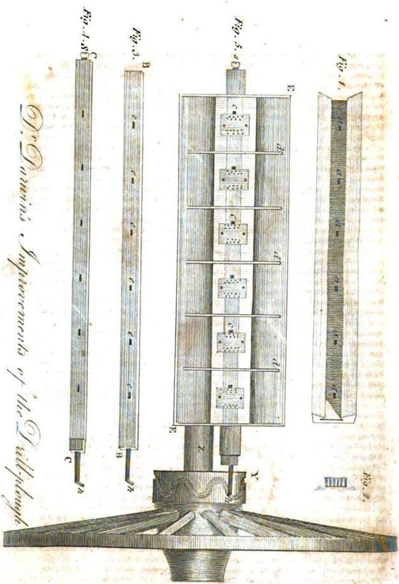
7. If 8 or 9 grains be dropped at the same time in one inch of ground, they will, if they all should grow together, be too numerous, and form a tussock; but, by making them slide down an inclined plane from the seed-box to the coulters, as in the tin flues, which are crossed in order to lengthen them, (Plate I. Fig 2) some of the seeds will, by their friction, while descending, be retarded more than others; and the 8 or 9 seeds will thus be scattered over the whole 9 inches of the drill; which renders this method of sowing far superior to that of dibbling; because in the latter, all the seeds are dropped together.

8. When the holes in the wooden cylinder are entirely open, they are of a proper size for the sowing of horse-beans, or peas: when they are perfectly closed, there will remain a small niche at the end of the excavation in the wooden cylinder, nearest to B, (Plate I. Fig. 4) for turnip or other small seeds. For wheat, barley, and oats, a wooden wedge ought to be made exactly of the same shape as the area of the hole, which the director of the plough requires, who will insert it occasionally in the holes, when he turns the screw at the end of the cylinder, in order to enlarge, or reduce them, according to those dimensions. On these wedges ought to be written, with white paint, *wheat, barley, oats*, &c. which will considerably facilitate the accommodation of the size of the excavations to each kind of grain; and which may be altered, if requisite, to suit larger or smaller seeds of the same species.

9. In some drill-ploughs, for instance in Mr. **Cooke's**, there is some additional machinery for drawing a line, while the plough proceeds, in which the wheel that is next to the last sown furrow, may be directed to pass at a proper distance from, and parallel to it. This, however, may be effected, when sowing wheat, or peas and beans, by making the wheels, while they run on the ground, at the exact distance of 54 inches from each other; and, at the time of sowing, by guiding the wheel nearest to the part last sown exactly in the rut last formed; by which means every row will be accurately made, at the distance of 9 inches.

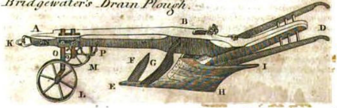
To these observations, Dr. **Darwin** has subjoined some remarks, tending to evince, by comparison, the essential improvements he has made on this complicated machinery, and from which we extract the following:

1. The simplicity of his drill-plough consists, first, in its having a seed-box



Dr. Darwin's Improvements of the Drill-plough

Bridgewater's Drain Plough.



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only, and not a seed-box and hopper, as is the case with Mr. Cooke's patent drill-plough.

2. The flues, conducting the seed from the bottom of the box into the drill furrows, are not disjoined in the middle, to permit the lower part to move either to the right or left, when the horse deviates from the line in which the coulters pass, as in Mr. Cooke's plough; this defect may be remedied by the simple universal joint at *z*, (Plate I. Fig. 1).

3. In this machine, the shafts behind, between which the man guiding the coulters walks, are fixed to the coulter-beam, as well as to the axle-tree; whereas, in Mr. Cooke's patent drill-plough, all these are moveable joints similar to a parallel rule, in order to counteract the swerving of the horse; which, in this machine, is effected by the simple universal joint at *z*, (Plate I. Fig. 1) already described.

4. The dimensions of the holes in the axis of the seed-box are here likewise altered, merely by turning a screw, so as to accommodate them to every kind of seeds which are usually sown on fields, or arable lands.

5. The strong brush of bristles, which sweep over the excavations of the cylinders beneath the seed-box, and strickle them so exactly, that no supernumerary seeds escape; and yet none are either bruised or broken, which sometimes happens in Mr. Tull's original machine.

Lastly, Dr. Darwin justly observes, that the cheaper and more simple the machine is in its construction, the less liable will it be to accidents, which occasion expenses in its repair; and, with the greater facility will its management be understood; all which circumstances correspond with its greater simplicity: and we cordially hope with the Doctor, that the practice of the drill-husbandry will thus be more generally diffused.

Plate II. Fig. 1, is a seed-box, invented by Mr. Swanwick, of Derby, who has liberally offered to shew the working models of the seed-boxes, or to assist any person who may wish to construct either this drill machine, or the preceding one, invented by Dr. Darwin.

Mr. Swanwick's seed-box is 48 inches in length within, and is divided into 6 cells, for the purpose of sowing 6 rows of seeds at the same time, similar to that above specified. At the bottom of each cell is a hole *a, a, a, a, a, a*, (Fig. 1) through which the seed passes into the seed-flues, as in the machine before described; but this has no revolving axis, there being only a wooden or iron bar, B, B, (Fig. 3) about 2 inches broad, 4 feet 8 inches long, and exactly 3-8ths of an inch thick. Through this bar 6 holes are perforated, marked *e, e, e*, &c. each of which is exactly one inch in length, half an inch in width, and 3-8ths of an inch in depth, which is the same as the thickness of the bar. The centres of these holes are exactly 8 inches distant from each other, corresponding to the holes at the bottom of the seed-box, over which it is made to slide backwards and forwards in a groove. By this sliding motion, it passes under stiff brushes which are placed over it on each end of the holes, at the bottom of the seed-box, and strickle off the grain, as the holes in the sliding-bar pass under them, which thus distribute the quantity with considerable accuracy.

In order to increase or diminish the proportion of grain to be delivered, the slider is covered with a tin case, C, C, (Fig. 4) which is perforated with six holes, corresponding with those in the slider: instead, however, of the bit of tin being cut out the full length of the hole, part of it is left at the end equal to the thickness of the slider: and is bent down, after the slider is put into the case, in the same manner as the tin cylinder in the preceding machine. This case is moveable about one inch, backward and forward, by turning the finger screw *s*, (Fig. 4 and 5) by which the holes are enlarged or diminished, for the purpose of adapting them to various sorts of grain, or different quantities of the same sort, exactly as in the tin and wooden cylinders in Plate I. The slider is moved forwards by a bent iron pin, *h*, attached to it, which passes into a serpentine groove Y, Fig. 5) fixed to the nave of the wheel: it is likewise moved backwards by a steel spring at the other end of the seed-box, but which is not delineated in the plate.

Fig. 5, is a bird's-eye view of the parts before described: E, E, the seed-box divided into cells or compartments, by the partitions *d, d, d*. *c, c, c*, the slider, with part of the apertures seen just appearing from under the brushes. X is the axis of the wheel.

Fig. 2, represents a side view of one of the six bridges lying over the holes at the bottom of the seed-box, on each side of which the brushes are fixed, which strickle the holes when full of corn, while the bar slides backwards and forwards. The simplicity of this slider at the bottom of the seed-box, Dr. Darwin observes, may be, in some instances, greater than that of wooden and tin cylinders in his machine, as Mr. Swanwick's has only six holes for distributing the quantity of corn, whereas the former has twenty-four. In other respects, it is, perhaps, more complicated; as twelve brushes are used, one on each side of the six holes, whereas there are only six brushes rubbing on the tin cylinder in the former machine. The reciprocating motion of this slider must be quick, as it necessarily acts once every time the circumference of the carriage-wheel passes nine inches forward, which may not be so easy to execute as the cog-wheel, with the uninterrupted movement of the axis and cylinder in the preceding machine.

Lastly, Dr. Darwin concludes with remarking, that the facility of adapting the holes to the dimensions required in both machines, and the circumstance, that they neither bruise nor break the grain, and are not encumbered with an additional hopper, which must deliver the quantity of seed with great inaccuracy, from the unequal shaking of the machine, considerably add to the excellence and simplicity of both.

[Many other drill-ploughs have been invented, which it would be almost endless to describe.—T. C.]

For a more particular account of the drilling system, we must refer our readers to Mr. Amos's "*Theory and Practice of Drill-Husbandry*," published a few years since, in which the matter is fully investigated, and the advantages and disadvantages are fairly appreciated. But those, who wish to acquire only a general knowledge of this important practice, we advise to peruse the Rev. Mr. Cooke's pamphlet, entitled, "*Drill-Husbandry perfected*."

Before we conclude this highly important subject, it will be useful to state the extraordinary national saving that would arise from a general introduction of the drill-husbandry. Indeed, the patriotic Lord Somerville, late President of the Board of Agriculture, whose exertions in promoting that beneficial science, must endear him to every friend of his country, has already anticipated our calculations. Though bred to the broad-cast method, which he till lately followed, that enlightened nobleman, has, in the appendix to his interesting work, entitled, "*The System followed during the two last years by the Board of Agriculture*," &c. impartially exhibited the great advantages that might result from the national adoption of the drill-husbandry. We regret that our limits will permit us only to extract a few leading circumstances from his Lordship's publication. In order to ascertain, beyond the possibility of doubt, the infinite superiority of the drilling, over that of the broad-cast method of sowing, he applied to three gentlemen alike eminent for their agricultural skill, and each of whom made use of different drill-ploughs. From an accurate statement it appears, that the expenses attendant on the old and new practices, are as follow:

Expense of seed-corn on 133 acres of land, sown in the usual broad-cast husbandry in 1799, was - - -	134*l*. 10*s*. 6*d*.
The expense of seed-corn for the same number of acres, according to the present improved system of drilling, -	100*l*. 4*s*. 6*d*.
In the year 1800, the expense of 140 acres broad-cast, was -	216*l*. 10*s*. 0*d*.
Ditto, - - ditto, drilled. -	92*l*. 0*s*. 0*d*.

Which affords a saving of not less than 134*l*. 10*s*. 0*d*. in seed-corn on 140 acres of land.

Both estimates were made from actual experience, by the industrious Mr. Budden, and communicated to Lord Somerville, by the Rev. H. J. Close, of Hordle, near Lymington; from whose letter we insert the following computation of an *annual saving* that may be effected by the uniform practice of the drill-husbandry; and which, at a moderate calculation, will amount to not less than *eight millions* of bushels of wheat, *one million* of bushels of rye, *three millions* of bushels of barley, *four millions* of bushels of oats, and *one million* of bushels of beans and peas!

Having, however, in the course of attentive observation, during the last twenty years, witnessed many disappointments, both in *statistical* and *political* schemes, we are not so sanguine in our expectations, as to place implicit confidence on any general statement, especially when it is exemplified by *round* numbers. Nevertheless, in justice to the zealous supporters of the drill plough, we fully admit its superiority over the clumsy and irregular practice of the wasteful broad-cast husbandry; and posterity will ever gratefully remember the names of Tull, Cooke, Young, and Darwin, if, by their joint labours, *one half* of the above stated quantity of grain and seeds, that is, together *eight or nine millions of bushels*, could be *annually* saved to the nation, before one half of the present eventful century is expired.

DROMEDARY, or **Arabian Camel**, (*Camelus dromedarius*), is distinguishable from every other species of camel by having a single bunch upon the middle of its back.

This animal, which is a native of many of the deserts of Asia and Africa, is of a tawny grey colour, and has soft hair, which is longer on the neck, under the throat, and on the bunch, than elsewhere.

The Arabian, like all other species of camel, has its upper lip cleft, and its feet with two long hoofs on which it treads, and two others shorter, which do not touch the ground.

These animals constitute the principal source of riches, and the whole force and security of the Arabians. They are the only beasts by which the inhabitants of the sandy deserts of many parts of Asia could travel or convey their burdens. Their tough and spungy feet, which are peculiarly adapted both to the climate and the country, and their abstemious temperament, but particularly their capability of travelling without water for many successive days, enable them to perform such journeys as would destroy probably every other species of quadruped. The caravans, or troops of merchants, which traverse in all directions the deserts of Egypt and Arabia are always accompanied by camels, which are often more in number than the men. These commercial travels are sometimes to the distance of 700 or 800 leagues, and are usually performed at the rate of ten or twelve leagues a day, the camels being every night unloaded to rest and feed. For the latter purpose, if better provender cannot be had, they are contented with a small quantity of dates or a few beans, together with the scattered and oftentimes bitter herbage which the desert affords. The burden of each camel usually weighs about half a ton, and at the command of his conductor he kneels down for the greater convenience of being loaded. It is from this practice that we account for those horny parts which are observable on the bellies, knees, and limbs, even of the animals which are exhibited in England. Camels are trained from the earliest part of their life to the labours which they are afterwards to perform: and with this view, when but a few days old, their limbs are folded under their body, and they are compelled to remain on the ground whilst they are loaded with a weight, which is gradually increased as they increase in strength. As soon as they have acquired sufficient strength they are trained to the course, and their emulation is excited by the example of horses or of other camels.

The pace of the camel is a high and swinging trot, which to persons unaccustomed to it is at first disagreeable and apparently dangerous, but is afterwards sufficiently pleasant and secure. The Arabians in general ride on a saddle that is hollowed in the middle, and has at each bow a piece of wood placed upright, or sometimes horizontally, by which the rider keeps himself in the seat. A ring is inserted into the nostrils of the camel, to which a cord is affixed; and this serves as a bridle to guide and stop him, or to make him kneel when the rider wishes to dismount. Mr. Bruce informs us that in the caravans of one of the Abyssinian tribes the people armed with javelins sometimes ride two together on each camel, and sit back to back.

The camels of Sahara are probably more fleet than any that are known; and on these animals the Arabs, with their loins, breast and ears bound round, to prevent the injurious effects of percussion from the quickness of motion, can cross that great desert in a few days. With a goat's skin or a porous earthen pitcher filled with water, a few dates, and some ground barley, the Arab travels from Timbuctoo to Morocco, feeding his camel but once upon the road. In one instance a camel was known to travel from Fort St. Joseph, on the river Senegal, to the house of Messrs. Cabane and Depras at Mogador, a distance of more than 1000 miles, in seven days.

It has been observed that the camel is the most completely and most laboriously enslaved of all animals: the most completely, because in the other kinds of domestic animals we find at least some individuals in their natural state, and which have not yet been subdued by man: but the whole species of the camel is enslaved; and not any of them are now to be found in their primitive state of independence and liberty. He is the most laboriously enslaved because he has never been trained, but as a beast of burden whom man has not harnessed nor taught to draw, but whose body is considered a living carriage which may be loaded and oppressed.

The above are not the only uses of the camel. The *hair* or fleece of these animals, which is renewed every year, and which regularly falls off in the spring, is so soft that the finest parts of it may be manufactured into stuffs of beautiful texture; and in Europe, when mixed with the fur of the beaver, it is sometimes made into hats. The inhabitants of some parts of Sahara live in tents of woven camels' hair, which forms a thick covering completely water proof. After the hair has been stripped off, the *skin* is converted into leather.

In Arabia the *milk* of the camel is a most important article of nutriment; and the *flesh*, though dry and hard, is not unpalatable, particularly when young. By the inhabitants of Egypt this is so much esteemed that, in Cairo and Alexandria, it was formerly forbidden to be sold to the Christians. In many parts of Africa the *tongues* are salted and dried, both for use and exportation; and with the ancient Romans the heels of camels were eaten as a great delicacy.

The *Bactrian*, or *Two-bunched Camel*, (*Camelus bactrianus*), is known from the Arabian species by having two bunches on its back, by being somewhat larger, and having shorter legs.

This animal is found in Usbec Tartary, the ancient Bactria: it is likewise a native of Siberia, Thibet, and some parts of China. See Camel, *ante*.

The purposes to which the Bactrian camel are applied are the same as those already described respecting the Arabian species. These animals, however, are sufficiently hardy to sustain the climate of the temperate parts of Siberia, and to be able, without injury, to traverse even humid and marshy countries, which would soon prove fatal to the Arabian camel.

The *Llama*, or *Glama*, (*Camelus glama*,) is a South American species of camel of small size, which has a protuberance on the breast and no bunch on the back.

The colour of the llama is white, grey, and russet, variously disposed. Its height, to the top of the back, is somewhat more than four feet, and to the head nearly six feet.

Without the aid of these animals the Spaniards who inhabit the mining districts of South America would labour under great inconveniences for the transport of their merchandise and treasures; since mountains which would be altogether inaccessible to the horse are with facility traversed by the llama. This beast, though not so patient, is nearly as abstemious as the camel. He proceeds, when loaded, with a slow but sure pace, and performs journeys in these mountainous regions more than 200 leagues in extent. Sometimes he will travel four or five days successively without appearing desirous of repose, and then he rests spontaneously for twenty or thirty hours before he resumes his toil. Like the camel, these animals kneel down to be loaded; and they are directed in this and most other of their motions by their conductor's whistle. The value of the best llamas is about eighteen ducats, and of the common ones twelve or thirteen ducats each. The burdens they are able to carry are from 150 to 200 pounds' weight; and the number that is kept in actual employ is supposed to exceed 300,000.

Of the *skin* of the llama a hard kind of leather is made, which is converted into harness, the soles of shoes, and to many other useful purposes. But as it is only tanned, and not curried, it is soon injured by exposure to wet. The *hair*, or fleece, particularly of the wild llamas, which is longer than that of the animals in a domesticated state, is much in request for the manufacture of camlets and other stuffs, some of which are of very beautiful texture, and also for the making of hats. On this account they are frequently hunted in the plains with dogs, or killed with guns; but such is their activity amongst the rocks, that, if they can once reach these, the hunters are generally obliged to desist from any further pursuit. The *flesh* of the llama is a wholesome and excellent food. Sometimes it is salted, and in this state, like our salt beef, is adopted as provision for ships proceeding on long voyages. That, however, of the young llamas four or five months old is preferred, and is considered as good as veal. Many parts of these animals are adopted by the inhabitants of South America as medicines.

The *Vicuna*, (*Camelus vicugna*), is a small South American species of camel, with woolly fleece, a flat and blunt nose, an erect tail; and without any bunches.

This animal inhabits, in a wild state and in extensive flocks, the highest peaks of the Andes.

Unable to sustain the weight of burdens exceeding sixty or seventy pounds, the vicuna is seldom employed in the transport of merchandise. It is chiefly in esteem on account of its *fleece*, which is naturally of a dead rose colour, and as soft and valuable as silk. This in South America is spun and woven into gloves, stockings, quilts, carpets, and innumerable other articles, which sell at great price, and constitute an important branch of commerce.

In most of their habits these animals have a very close alliance with the llama, and their general figure is nearly the same. They are gentle and inoffensive, and, though not tamed with quite so much facility, are capable of great attachment for those who have the care of them. Amongst their native mountains they are so light and agile in all their motions that it is not easy to come within reach of them except by stratagem; and consequently, though dogs are sometimes employed to hunt them, they are much more frequently killed by snares or traps than in any other way.

In consequence of the great advantages which in America are derived from the wool of the vicuna, the Spaniards were some years ago induced to attempt the introduction of these animals into Europe. Some of them were brought to Spain; but from the want of proper attention to their natural habits the experiment entirely failed.

DRONE, in natural history, a species of bee, which is nearly double the size of the common working insect. The head of drones is round, the eyes full, the tongue short, and the belly broader than in the other classes; they are likewise of a darker colour, and more thickly clothed. See BEE.

DROPSY, a soft, unelastic swelling of the whole or part of the body: in other words, a collection of water under the whole skin, or in the brain, chest, abdomen, &c. [We shall treat of this in the article appropriated to domestic medicine.—T C]

DROSSERA, in botany, a genus of plants, herbaceous and of small size, and very singular in their structure. The leaves are furnished with glandulous hairs on the upper surface, and fringed round the edge: these hairs have each a small globule of pellucid liquor like dew, continuing even in the hottest part of the day, and in the fullest exposure to the sun. Hence the English name "the sun-dew." The Drosera acaulis has a sessile flower in the bosom of the root leaves. These plants have the property of entrapping small insects within their folded leaves. This fact was discovered by Mr. WHATELY, who observed a fly in close imprisonment, in one of the contracted leaves, and on centrically pressing other leaves still in their expanded form, with a pin, he observed a sudden elastic spring of them so as to become inverted upwards, and as it were encircling the pin.

DROWNING is the act of suffocating, or being suffocated, by a total immersion in water. The length of time during which a person may remain in this element, without being *drowned*, is very unequal, in different individuals; and depends as much on the temperature of the water as on the particular constitution of the subject: in general, however, there is little prospect of recovery, after having continued thirty minutes in a watery grave. In such cases, death ensues from impeded respiration, and the consequent ceasing of the circulation of the blood, by which the body loses its heat, and, with that, the activity of the vital principle. Dr. GOODWIN justly observes, that the water produces all the changes which take place in drowning, only *indirectly*, by excluding the atmospheric air from the lungs, as they admit but a very inconsiderable quantity of fluid to pass into them, during immersion. Hence we shall find, in the progress of this enquiry, that inflation of the lungs is one of the principal means of restoring life.

Before we describe the various methods and instruments that have been successfully adopted, for recovering drowned persons, it will be useful to advert (on the plan of Dr. STRUVE) to those circumstances which deserve to be duly weighed, previously to any *active* measures being taken on such unfortunate occasions: 1. The season and weather; 2. Length of time the person has continued under water; 3. The state of his mind when the accident happened: whether he was intoxicated, frightened, &c.; 4. Constitution of the body, and whether he was in a state of perspiration; 5. The height from which he fell, and whether his head plunged foremost; 6. Depth of the water; whether it was cold or warm, sea, or river water, and how he was dressed. Lastly, 7. The manner in which he was taken out, whether by the legs, and without receiving any injury, or by instruments; and whether he was rolled about in a tub, or what other methods were pursued for his restoration.

Few improvements appear to have been made in the treatment of the drowned, since this important branch of medical science was first discussed, in a *popular* manner, by the late Dr. Tissot; yet the names of Cullen, Goodwin, Cogan, Hawes, and Coleman, in Britain, as well as those of Unzer, Reimarus, and Struve, in Germany, deserve to be respectfully mentioned. From their various publications, and especially of the two last mentioned, we shall briefly state the principal rules of conduct to be observed, with respect to persons in that deplorable situation.

Symptoms of Apparent Death by Drowning.—Coldness; paleness of the whole body; the lips of a livid hue; the mouth either open or firmly closed; the tongue blue, swelled and protruded; the eyelids closed, the eyes turned, and their pupils dilated; the face swelled and blue; the lower belly hard and inflated. The first signs of returning animation are, convulsive starting of the muscles of the face, or feet; motion of the eyelids, a spasmodic shivering of the body.

Treatment.—1. After having been carefully taken out of the water by the arms, so as to prevent the least injury to the head and breast, the body ought to be carried to the nearest house (if possible, in a bier, as represented in the plate which is described, p. 77), with the head somewhat raised; or, in fine warm weather, the resuscitative process may with more advantage be performed in the open air, especially in sun-shine.

2. When the subject is deposited, the upper part of the body should be supported half-sitting, with the head inclining towards the right side.

3. The clothes are to be taken off without delay, but with the greatest precaution; as violent shaking of the body might extinguish the latent spark of life.

4. The mouth and nose must be cleansed from the mucus and froth, by means of a feather dipped in oil.

5. The whole body should now be gently wiped and dried with warm flannel cloths, then covered with blankets, feather beds, hay, straw, &c. In cold or moist weather, the patient is to be laid on a mattress or bed, at a proper distance from the fire, or in a room moderately heated; but in the warm days of summer, a simple couch is sufficient.

6. If the patient be very young, or a child, it may be placed in bed between two persons, to promote natural warmth. (See also the *Warming Machine*, delineated in the second plate, and described, p. 77.)

7. In situations where the bath cannot be conveniently procured, bladders filled with lukewarm water should be applied to different parts of the body, particularly to the pit of the stomach; or a warming-pan wrapped in flannel gently moved along the spine; or aromatic fomentations frequently and cautiously repeated.

8. As the breathing of many persons in an apartment would render the air mephitic, and thus retard, or even prevent the restoration of life, not more than five or six assistants should be suffered to remain in the room where the body is deposited

Stimulants generally employed.

1. Moderate friction, with soft, warm flannel, at the beginning, and gradually increased by means of brushes dipped in oil, till pulsations of the heart are perceptible.

2. Inflation of the lungs, which may be more conveniently effected by blowing into one of the nostrils, than by introducing air into the mouth. For the former purpose, it is necessary to be provided with a wooden pipe, fitted at one extremity for filling the nostril, and at the other for being blown into by a healthy person's mouth, or for receiving the muzzle of a pair of common bellows, by which the operation may be longer continued. At first, however, it will always be more proper to introduce the warm breath from the lungs of a living person, than to commence with cold atmospheric air. During this operation, the other nostril and the mouth should be closed by an assistant, while a third person gently presses the chest with his hands, as soon as the lungs are observed to be inflated For a more effectual method of alternately introducing fresh air into the lungs, and expelling that which is rendered mephitic, or unfit for respiration, we refer the reader to the second plate, Fig. 1.

3. Stimulating clysters, consisting of warm water and common salt; or a strong solution of tartar emetic; or decoctions of aromatic herbs; or six ounces of brandy, should be speedily administered. We do not consider injections of the smoke of tobacco, or even clysters of that narcotic plant, in all instances safe or proper.

4. Let the body be gently rubbed with common salt, or with flannels dipped in spirits: the pit of the stomach

Fig. 1.

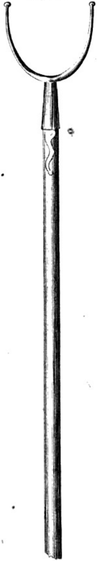


Fig. 2.

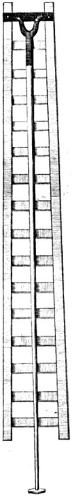
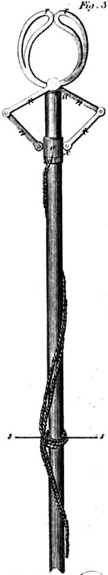


Fig. 3.



Instruments for recovering the Drowned.

fomented with hot brandy; the temples stimulated with spirit of hartshorn; and the nostrils occasionally tickled with a feather.

5. Persons of a very robust frame, and whose skin after being dried, assumes a rigid and contracted surface, may be put into the sub-tepid bath, of about 65 deg. which must be gradually raised to 75 or 80 deg. of **Fahrenheit's** scale, according to circumstances; or the body carried to a brew-house, and covered with warm grains for three or four hours: but these expedients generally require medical assistance.

6. Violent shaking and agitation of the body by the legs, and arms, though strongly recommended, and supposed to have often forwarded the recovery of children and boys, appears to us a doubtful remedy, which can be practised only in certain cases.

7. Sprinkling the naked body of a drowned person with cold water; submitting it to the operation of a shower-bath, or the sudden shocks of the electric fluid; as well as whipping it with nettles, administering emetics, and blood-letting,—are desperate expedients, which should be resorted to only after the more lenient means have been unsuccessfully employed.

It is, however, a vulgar and dangerous error, to suppose that persons apparently dead by immersion under water, are irrecoverable, because life does not soon reappear: hence we seriously intreat those who are thus employed in the service of humanity, to persevere for three or four hours at least, in the application of the most appropriate remedies above described; for there are many instances recorded, of patients, who recovered, after they had been relinquished by all their medical and other assistants.

Treatment on the return of life:

As soon as the first symptoms of that happy change become discernible, additional care must be taken to cherish the vital action, by the most soothing means. All violent proceedings should, therefore, be immediately abandoned, no farther stimulants applied, nor even the ears of the patients be annoyed by loud speaking, shouting, &c. At that important crisis, moderate friction only is requisite. And, if the reviving person happen to be in the bath, he may either remain there, provided his sensations be easy and agreeable, or be removed to a comfortable bed, after being expeditiously dried with warm flannels: fomentations of aromatic plants may then be applied to the pit of the stomach; bladders filled with warm water, placed to the left side; the soles of the feet rubbed with salt; the mouth cleared of froth and mucus, and a little white wine, or a solution of salt and water, dropped on the tongue. But all strong stimulants, such as powerful electric shocks, strong odours of volatile salts, &c are at this period particularly injurious. Lastly, the patient, after resuscitation, ought to be for a short interval resigned to the efforts of Nature, and left in a composed and quiescent state: as soon as he is able to swallow, without compulsion or persuasion, warm wine, or tea, with a few drops of vinegar, instead of milk, or gruel, warm beer, and the like, should be given in small doses frequently repeated.

Having stated the leading particulars to be attended to, in the practical treatment of persons who are on the eve of suffering from aquatic suffocation, we shall accompany them with a few directions, addressed to those humane assistants who often fall victims, for want of due precaution in the execution of their benevolent design.

As many fatal accidents happen to individuals who wish to rescue others in danger of being drowned, especially when the former are unskilful in the useful art of swimming, which ought to be learnt at an early period of life, we think it our duty to remind the reader of the two excellent contrivances already described in our first volume, under the articles **Air-jacket**, and **Bamboe Habit**. Every family dwelling on the banks of lakes or rivers, or near ponds, ought to be always provided with two or three such useful articles, to serve in cases of emergency; as it will generally be too late to procure them on the spur of the occasion.

EXPLANATION.

I. *Of the Plate representing the "Instruments for recovering the Drowned."*

Fig. 1, A forked instrument with blunt points, for making a superficial search after the drowned body, and sounding the particular situation in which it lies.

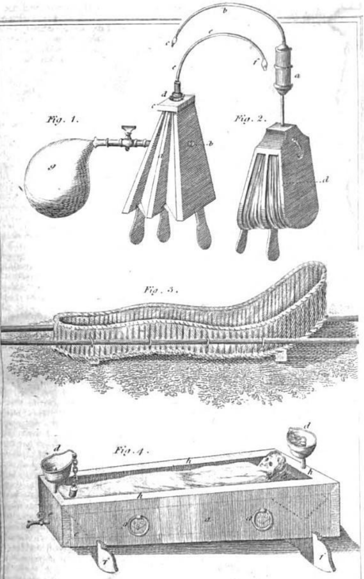
Fig. 2, A ladder with a long, jointed handle, and which we have already mentioned, when treating of the **Ice-boats**: a model of these boats may be inspected in the Repository of the "*Society for the Encouragement of Arts, Manufactures,*" &c. Adelphi, London.

Fig. 3, An *extractor*, or a linked pair of tongs, which in the plate appears closed; but, on immersing it into water, opens by its own weight, as well as by the sliding down of the iron ring *o* from the part marked *x*, to that of *u*. It may again be closed, by pulling the double rope fastened to the ring *o*, which is thus shifted upward from *u* to *x*: by means of expanding the iron arms *n n*, which are likewise connected with this ring, the mouth or flaps of the instrument *r r*, may be shut: and to prevent their opening till required, the two ropes are firmly tied round the iron bolt *s s*; in which situation they remain till the body is extracted. This instrument, together with that represented, Fig. 1, cost about 2*l.* at Hamburg. Great attention is required in preserving them from the effects of rust; and, independently of the weight of iron-work, Fig. 3, is perhaps the most complete piece of machinery that can be contrived for this purpose.

II. *Of the Engraving in which the "Implements of restoration from drowning," are represented.*

Fig. 1, A pair of bellows with two separate bags, so contrived that by opening them, when applied to the nostrils or mouth of a patient, one bag will be filled with common air, and the other with the mephitic air extracted from the lungs; and, by shutting them again, pure atmospheric air will be introduced into those organs, and that drawn out, consequently discharged into the room. Thus, the artificial breathing may be continued, while the other operations on the surface of the body are carried on; which could not be conveniently done, if the muzzle of a common pair of bellows were introduced into the nostril.

a, Is an intermediate board, but which admits of no communication between the two bags. In the external board of each side, there is the usual hole, marked *b*, provided with a valve; and the cylindrical part through which the air is expelled in common bellows, is here soldered to a copper box, within which two other valves are applied to the tubes conducting the air. The cover *d* of this box, which may be unscrewed by means of an interposed leather ring, is almost of the shape of a funnel, to the neck of which is fastened a flexible tube *e*, made of varnished silk cloth, and a spiral wire that forms the cavity. To the extremity of this tube is attached a small ivory pipe *f*, the front of which may be either tubular and round, for introducing it into the nostril: or flat like the top-piece of a clarionet, if it be intended for the mouth. The valves (which cannot be represented in a plate), consist of stiffened taffety, and are so arranged, that the corresponding ones stand in an inverted order. If, therefore, both bags of the bellows are expanded, *two* of the valves open themselves towards the internal part of the machine: one of these is fixed to one of the side-boards, but the other is within the box, in the mouth of the conducting tube belonging to the opposite bag of the bellows. By this contrivance, the air enters both bars of the bellows at the same time, and is, on compression, again expelled by means of two other valves, which open from within towards the external parts. Both bags of the bellows terminate below the valve in one particular tube of communication; because, though the action of both bellows is *simultaneous*, the stream of air, conformably to the arrangement before pointed out, can only enter, and escape, *alternately*. In using this machine, the small ivory pipe is applied either to one of the nostrils, or put into the mouth: in the former case, the other nostril and the mouth must be closed; in the latter, both nostrils. When the bellows are set in action, one of the bags receives a column of atmospheric air through its valve; while the other, by means of its flexible tube and its valve, extracts a portion of air from the lungs. But, if the bellows are again shut, one of the bags parts with the impure gas drawn out of the pulmonary vessels; and the second conveys pure atmospheric air to the organs of respiration. By properly repeating this alternate process, the patient may again be enabled to exercise the important function of breathing. As, however, a precipitate and irregular method of proceeding might be productive of injury, this delicate operation ought to be performed by persons who are acquainted with the mechanism of respiration. In some cases, where the patient has, for a considerable time, lain under water, or was afterwards neglected for want of due assistance, it would be desirable to introduce into his lungs *oxygen*, or pure vital dephlogisticated air, instead of that of the common atmosphere; as the latter is generally more or less corrupted on such occasions by the breath of many persons in the same room. For this purpose may be used a bladder, marked *g*, which is provided with a cock and pipe



Implements of Restoration from Drowning.

fitted or screwed to the board of the inspiring valve and bag of the bellows. If, therefore, after opening the cock, the machine is set in motion, it will extract the pure air contained in the bladder, and, on the subsequent compression of the bellows, force it into the lungs of the patient.

Fig. 2, A machine for injecting the smoke of tobacco by way of clyster, in these desperate cases which require the application of this remedy. It consists of a pair of bellows, to the muzzle of which is fitted a metal box, *a*, provided with a ring, in the middle of which it may be unscrewed, and again closed, after being filled with tobacco, and set on fire: the pipe *c*, which should be perfectly round and blunt at the top of the flexible tube *b*, is introduced into the fundament; and thus, by means of the bellows *d*, the smoke is forced into the rectum.

Fig. 3. A bier of wicker work, in the form of a slanting, oblong basket, for conveying the body of the drowned, in a posture somewhat raised. This simple contrivance has the advantage, that the water may easily run off, while the patient is carried: and, as many unfortunate persons are materially injured by rough treatment, before they arrive at a house of reception, so that their recovery is thus often frustrated, we recommend the universal adoption of this useful implement. It costs at Hamburgh only ten marks currency, or about 15*s*.

Fig. 4, The *Warming Machine* of block tin, or other metal, was originally invented by Mr. Harvey, of London, who suggested it to our Royal Humane Society, and it was subsequently improved by M. Braasch, an ingenious mechanic, of Hamburgh. Its object is to procure an uniform degree of warmth, throughout the apparatus, in the most expeditious manner, by filling the hollow or double bottom and sides of the whole implement with boiling water, *a*, is the body of the machine, seven feet long, and made of solid pieces of block-tin, to prevent the necessity of soldering them, and consequently the formation of iron-rust: it rests on two wooden legs *f*, *f*, and may be easily carried by the handles *g*, *g*. The water is poured in through both funnels *d*, *d*, in order to warm it more speedily; and each of these is provided with a stopper (as represented in the Plate, suspended on a chain,) with a view to prevent, if necessary, too sudden evaporation and cooling of the water: *h*, is the intermediate space between the two metallic plates, producing a vacuum of 2½ inches, in which the fluid is diffused over the whole machine; *b*, is a wooden desk to support the head of the patient, and to prevent it from the immediate contact with the heated parts; but, on the opposite end of the machine, there is an enlarged intermediate space *c*, for holding such a quantity of water and vapours as will procure an additional, or at least a more permanent degree of heat towards the lower extremities, than to the trunk of the body. For discharging the water, when it is not wanted, or changing it when too cold, there is a cock at *e*. The hollow sides of this machine are about twelve inches high; and in order to ensure an uniform warmth, the body apparently dead, should be placed on a straw mattress, and tucked in with blankets. A pailfull of water is required to fill the whole machine, as a smaller quantity would warm the sides only for a short time, by means of the vapour.

It deserves to be remarked, that this ingenious contrivance may also be used for a *warm bath;* for which purpose, the inner space in which the body lies, should be supplied with water. The whole apparatus, in its present improved state, made of *copper*, costs at Hamburgh about 200 marks, or from 14 to 15*l*.

Lastly, we cannnot conclude this subject, without affording the reader a view of the different articles, belonging to a complete chest of instruments, and other materials, employed in the various processes for recovering suspended animation from drowning. The merit of these inventions in England, is due to Drs. Cogan and Hawes, the founders of the Royal Humane Society at London; but the improved arrangement of the chest now to be described, together with the choice of internal and external remedies, were made by one of our most esteemed surgeons, Mr. Kite, in 1788, though considerably extended in 1790, by Mr Redlich, a respectable medical practitioner at Hamburgh. This gentleman is likewise one of the most active members of the Humane Society in that city, and has offered the following articles for sixty five marks, or about four guineas and a half. His complete chest contains:

A small bottle of rectified spirit of wine.
Ditto, white wine vinegar.
Ditto, sweet oil.
Ditto, white French brandy.
Ditto, volatile sal ammoniac.
Ditto, vitriolic æther.
Ditto, mustard-seed.
A machine for injecting the smoke of tobacco.
A leather tube, together with a pair of bellows, for inflating the lungs.
Another tube of leather, for introducing medicines into the stomach.
A small syringe for clearing the throat of mucus.
Three woollen covers, or blankets.
Four brushes and six woollen cloths, for performing friction.
Several emetics
Two lancets for blood-letting.
One pound of tobacco.
A roller and cushion, to be used in venesection.
Two quills, a sponge, and some lint.
A pocket-knife.
An apparatus for striking fire.
Chamomile and elder-flowers.
Common salt; and a printed copy of rules and directions for treating the drowned.

Rules for the Treatment of Drowned Persons, recommended by the Royal Humane Society of London.

1. In removing the body to a convenient place, care must be taken that it be not bruised, nor shaken violently, nor roughly handled, nor carried over any man's shoulder with the head hanging downwards, nor rolled upon the ground, nor over a barrel, nor lifted up by the heels; for experience proves that all these methods may be injurious, and destroy the small remains of life. The unfortunate object should be cautiously conveyed by two or more persons, or in a carriage upon straw, lying as on a bed, with the head a little raised, and kept in as natural and easy a position as possible.

2. The body, being well dried with a cloth or flannel, should be placed in a moderate degree of heat, but not too near a large fire. The window or the door of the room should be left open, and no more persons be admitted into it than those who are absolutely necessary; as the lives of the patients greatly depend upon their having the benefit of pure air. The warmth most promising of success is that of a blanket well heated. Bottles of hot water should be laid at the soles of the feet, to the the joints of the knees, and under the arm-pits; and a warming-pan, moderately heated, or hot bricks wrapped in cloths, should be passed over the body. The natural and kindly warmth of a healthy person lying by the side of the body has been found, in some case, particularly of children, very efficacious.

3. Should the accident happen in the neighbourhood of a warm bath, a brewhouse, bake-house, glass-house, or any fabric where warm lees, ashes, embers, grains, sand, water, &c. are easily procured, it would be of great importance to place the body in any of these, moderated to a degree of heat little exceeding that of a healthy person; or in summer, the exposure to sunshine has proved obviously beneficial. Friction with the hand, or with warm flannel, or coarse cloth, so as not to injure the skin, should also be tried with perseverance, for a considerable period of time.

4. The subject being placed in one or other of these advantageous circumstances as speedily as possible, a bellows should be applied to one nostril, whilst the other and the mouth are kept closed, and the lower end of the prominent part of the wind-pipe is pressed backward. The bellows is to be worked in this situation, and when the breast is swelled by it, the bellows should stop, and an assistant should press the belly upward, to force the air out. The bellows should then be applied as before, and the belly again pressed; this process should be repeated from 20 to 30 times in a minute, so as to imitate natural breathing as nearly as possible. Some volatile spirits heated, may be held under the valve of the bellows while it works. If a bellows cannot be procured, some person should blow into one of the nostrils, whilst the mouth and the other are closed. Where bellows or other apparatus cannot be had,

it will be highly proper to endeavour to excite the natural breathing, both of inspiration and expiration, by pressure on the thorax (*breast*), ribs, and abdominal muscles (*lower part of the belly*), merely by the hands, so as to press out as large a portion of the internal air as possible, and then removing and applying the pressure alternately, in order to imitate the natural breathing, and promote the introduction of the atmospheric air, in proportion to the quantity pressed out from the air-cells of the lungs. This method of exciting the lungs to action, has been tried with success in the restoration of several persons who in all probability would have perished without it.

5. If there be any signs of returning life, such as sighing, gasping, twitching, or any convulsive motion, beating of the heart, return of the natural color and warmth—opening a vein in the arm or external jugular of the neck may prove beneficial; but the quantity of blood taken away should not be large. The throat should be tickled with a feather in order to excite a propensity to vomit, and the nostrils also with a feather, snuff, or any other stimulant, so as to provoke sneezing. A tea-spoonful of warm water may be administered now and then, in order to learn whether the power of swallowing be returned; and if it be, a table-spoonful of warm wine, or brandy and water, may be given with advantage; and not before, as the liquor might fall into the lungs before the power of swallowing returns. The other methods should be continued with ardour and perseverance for two hours or upwards, although there should not be the least symptom of life. *N. B.* Dr. CURRY is of opinion that no case of a person recently drowned, ought to be given up as hopeless, till the proper measures have been persisted in, six hours at least.

6. In the application of stimulants, electricity has been recommended; and when it can be easily procured, its exciting effects might be tried in aid of the means already recommended; but the electric stroke should be given in a low degree, and gradually as well as cautiously increased.

Directions from the Humane Society, established some years ago in the City of New York.

Sudden apparent death may arise from drowning, hanging, drinking cold liquors, and eating ices in warm weather; the vapours of wells, cellars, fermenting liquors, and from the fumes of burning charcoal, and various metallic substances; from lightning, from exposure to excessive heat or cold; from confined rooms, and various other causes.

To recover those who are apparently dead, by drowning, 1. The body should be taken out of the water with as much care and tenderness as the circumstances will permit; endeavouring always to keep the head raised a little more than the body. In every case hanging it by the heels under the erroneous supposition of discharging water from the lungs; rolling it on a barrel, or putting it across a bag; and every kind of jolting and shaking, must be absolutely avoided as extremely injurious.

2. The body should be carried on a wide board, or in some other easy manner, to the nearest convenient place, into as large a room as can be had; the clothes must be immediately taken off, the whole skin wiped dry with flannel, and examined, so as to determine whether any wounds have happened to it, and the body should then be wrapped up in warm blankets. It should then be laid on a table, if at hand, with the head a little raised; and, if the weather be cold, before a fire. All crowds of people must be kept off; and no more than six persons must ever be admitted; and on many occasions they will be too many.

3. As soon as possible, after the foregoing directions have been attended to, a bellows,* which must be clear of all dirt and dust, should be applied to one nostril, while another person should close the other nostril and the mouth, and at the same time press back the lower part of the windpipe, where it is largest, or that part sometimes called Adam's apple. The person who holds the bellows must then blow gently, and repeat the blowing five or six times; when this is done, and the breast is a little swelled, a third person must press the belly up, so as to force the air out; this must be done quick and effectually. The first must then repeat the blowing three or four times, and the third again

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* The bellows most convenient for this operation should have a flexible pipe or tube, one end of which should be made to pass into the nostrils close and easy. If bellows, proper for the operation, cannot be procured, a pipe or quill may be used, some person blowing into the nostril through the quill; but this is never to be done when a proper bellows can be had.

press up the belly and force out the air. *N. B.* This operation must be repeated steadily, five or six times, and occasionally or frequently renewed, at the discretion of the attendants, so as at length to imitate natural breathing as much as possible.

4. After the lungs have been filled with air, a number of times, by the means above mentioned, the whole body, but particularly the breast, is to be rubbed with the hand, and, if oil and the spirit of hartshorn can be procured, let them be mixed in equal quantities, and rubbed on the breast and whole body; or, if these cannot be procured, the body may be briskly rubbed with flannels moistened with rum, or gin, made a little more than blood-warm. During this time, the means recommended in the third article, viz. the use of the bellows, is still to be continued.

5. As soon as the patient is able to swallow, and before, if means* can be found to introduce it into the stomach, he should take from twenty to one hundred drops of the essence of peppermint in a glass of water, or a tea-spoonful of æther, mixed with about ten or fifteen tea-spoonfuls of pure water; but if these are not easily procured, let him swallow half a gill of brandy, spirit, or wine, as is most convenient, and the dose should be repeated at the discretion of the persons who may have the care of the patient.

6. The feet and legs should be put into warm water, about blood-warm, and in the space of five or six minutes after this is done, warmer water should be poured into the vessel, so as to raise the temperature to about 98° of Fahrenheit's thermometer, which is two or three degrees above the blood heat in man. The feet should be continued in the warm bath, half, or even a whole hour, during which time, the body should be gently raised a little, and then supported with pillows and bolsters, or in any other convenient way, while brisk friction should be used over the whole body and limbs, especially the feet and legs; at the same time sneezing should be provoked by tickling the nostrils with a feather, or some other irritating substance.

7. If these means appear to give no relief within 30, or at most 40 minutes, after the recovery is attempted, warm water, with as much spirit of hartshorn, rum, or other distilled liquor mixed with it, as will produce a stimulating effect, ought, without any further delay, to be used for a clyster; this operation must be frequently repeated; after which the belly should be moved with the hands of one of the assistants, and the liquor be injected as far up the bowels as possible, till a motion ensue, upon producing which much of the success of the revival will depend. *N. B.* Bleeding in the arm or jugular veins, cutting open the windpipe, vomiting and the use of tobacco, being remedies of very doubtful and uncertain effect, perhaps always injurious, are absolutely to be avoided, unless by the express direction of a skilful person, who may judge by the symptoms, in what particular case these remedies ought to be tried.

8. Electricity† being a most powerful agent, is a very proper remedy, when employed by those physicians, or others who understand its operation, and know how to use it with safety, and with a probability of success In all cases, the machine should be made to excite powerfully, otherwise the attempt to use it will be a loss of time, and so the precious moments of recovery may be lost for ever. When it is practicable to use electricity, the patient may be properly placed on an electrical table, that is, insulated, and then electrified as much as possible; after this is continued four or five minutes, the hand of one of the attendants should be placed close to the body, so as to take strong sparks, which should be drawn from the left side over the heart. If this should produce no appearance of life or motion, light shocks (which should be increased every operation) should be sent from the breast bone through the back, or from side to side, so as to excite the heart to action if possible. Rubbing the electrified body

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* This may be best done by means of a flexible tube or syphon, which is to be introduced into the gullet, so as to convey liquors to the stomach. Into the upper end of the tube, a small funnel should be put, for conveying the liquors more readily.

† We fully agree with those who observe that electricity and other remedies of a difficult nature, are not to be proposed to common operators. "They have neither instruments, heads, hands, or time for such experiments—and it is dangerous to lead them from the other parts of the salutary practice, to the exercise of which they are equal." But whenever it is practicable to use electricity, the above directions are ound to be the best.

with a woollen cloth, will also be very proper, and this should be continued for the space of half an hour.

9. In all cases, one of the principal objects should be to restore a healthful degree of heat to the body, without which animal motion or life cannot be renewed. This is to be done by perseverance in the foregoing directions, and particularly by applying warm cloths to the body, which should be moistened with hot spirits, and by rubbing the body with them, and by applying hot bricks made wet with vinegar to the soles of the feet. If possible, two vigorous and healthful persons should be persuaded to strip themselves naked and lie on each side of the body, embracing it closely, and imparting their animal heat to the patient. But a warming pan with burning coals should never be used, on account of the intemperate heat and fumes of the coals.

10. In all cases of sudden apparent death, where no organ essential to life appears to be destroyed, the foregoing methods are to be persisted in, at least four hours, with uninterrupted perseverance; and no others are to be used without the express advice of a physician, who should be called to the patient as soon as possible.

11. Whenever the methods employed are successful, great care ought to be taken to restore the equal action of the system; to relieve the convulsive motions; to make every thing quiet and easy about the patient; to keep the bowels free; to use moderate bleeding when the symptoms in the recovered person require it, and to regulate the diet and exercise.

Method of rendering assistance to Persons in danger of Drowning.

This desirable object seems attainable by the proper use of a man's hat and pocket-handkerchief, (which being all the apparatus necessary) is to be used thus: spread the handkerchief on the ground, and place a hat with the brim downwards, on the middle of the handkerchief; and then tie the handkerchief round the hat as you would tie up a bundle, keeping the knots as near the centre of the crown as may be. Now, by seizing the knots in one hand, and keeping the opening of the hat upwards, a person without knowing how to swim, may fearlessly plunge into the water with what may be necessary to save the life of a fellow creature. If a person should fall out of a boat, or the boat upset by going foul of a cable, &c. or should he fall off the quays, or indeed fall into any water from which he could not extricate himself, but must wait some little time for assistance, had he presence of mind enough to whip off his hat, and hold it by the brim, placing his fingers within side the crown, and hold it so, (top downwards) he would be able by this method, to keep his mouth well above water till assistance should reach him. It often happens that danger is descried long before we are involved in the peril, and time enough to prepare the above method; and a courageous person would seven instances out of ten, apply to them with success; and travellers, in fording rivers, at unknown fords or where shallows are deceitful, might make use of these methods with advantage.

DRUNKENNESS, a well known affection of the brain occasioned by drinking too freely of intoxicating liquor. Drunkenness appears different in different constitutions: some it makes gay, some sullen, and some furious. The mischief of drunkenness consists in the following bad effects. 1. It betrays most constitutions either into extravagances of anger, or sins of lewdness. 2. It disqualifies men for the duties of their station, both by the temporary disorder of their faculties, and at length by a constant incapacity and stupefaction. 3. It is attended with expenses, which can often be ill spared. 4. It is sure to occasion uneasiness to the family of the drunkard. 5. It shortens life. To these consequences of drunkenness must be added the peculiar danger and mischief of the example. "Drunkenness (says PALEY) is a social festive vice. The drinker collects his circle: the circle naturally spreads; of those who are drawn within it, many become the corrupters and centres of sets and circles of their own; every one countenancing and perhaps emulating the rest, till a whole neighbourhood be infected from the contagion of a single example. With this observation upon the spreading quality of drunkenness may be connected a remark which belongs to the several evil effects above recited. The consequences of a vice, like the symptoms of a disease, though they be all enumerated in the description, seldom all meet in the same subject. In the instance under consideration, the age and temperature of one drunkard may have little to fear from inflammations of lust or anger; the fortune of a second may not be injured by the expense; a third may have no family to be disquieted by his irregularities; and a fourth may possess a constitution fortified against the poison of strong liquors. But if, as we always ought to do, we comprehend within the consequences of our conduct, the mischief and tendency of the example, the above circumcumstances, however fortunate for the individual, will be found to vary the guilt of his intemperance, less, probably, than he supposes. Although the waste of time and money may be of small importance to you, it may be of the utmost to some one or other whom your society corrupts. Repeated or long continued excesses which hurt not your health, may be fatal to your companion. Although you have neither wife nor child, nor parent, to lament your absence from home, or expect your return to it with terror, other families, whose husbands and fathers have been invited to share in your ebriety, or encouraged to imitate it, may justly lay their misery or ruin at your door. This will hold good, whether the person seduced, be seduced immediately by you, or the vice be propagated from you to him through several intermediate examples."

With regard to the theory of drunkenness, it may be observed, that the common and immediate effect of wine is to dispose to joy, that is, to introduce such degrees of vibrations into the nervous system as are attended with a moderate degree of pleasure. This it seems to do by impressing agreeable sensations on the stomach, which are thence propagated to the brain, continue there, and call up the several associated pleasures that have been formed from pleasant impressions made upon the alimentary duct. The sickness and head-ach which drunkenness occasions the succeeding morning, arise, probably, from the immediate impressions made on the nerves of the stomach, and from the sympathy which the parts of the head have with the brain, the part principally affected in drunkenness, by deriving their nerves immediately from it.

Drunkenness is punishable by fine and imprisonment, and in law, is no excuse for any crime committed during the paroxysm.

[In coma, and convulsions from drunkenness, give purging clysters, and saline cathartics by the mouth; shave the head and put on a blister.—T. C.]

DRY-ROT is so called by architects in contradistinction only to the more usual circumstances of decay to which wood is liable: such a designation however does not appear the most eligible, as it is now sufficiently ascertained to arise only from moisture. The dry-rot, as it is called, then consists in a more or less rapid decomposition of the substance of the wood from moisture deposited on it by condensation: to the action of which it is more disposed in certain situations than in others; and this moisture operates more quickly on wood which most abounds with the saccharine or fermentible principle of the sap. In "*Randall's Philosophical Enquiry*," a work professedly written on the subject, the following remarks appear: "Several pieces of fir-wood having been promiscuously thrown together in a moist situation and left there only a few weeks, were, upon being accidentally removed, found in a high state of fermentation, and almost wholly enveloped in a film of white mould, which on further examination appeared to be a complete fungus." This fact appears satisfactory, in as far as it sheweth that where a sufficient degree of humidity takes place, and other things favourable to give the stimuli to the fermentation, the dry-rot is produced. The pine or fir, of which wood most of our buildings are timbered, is known to contain a considerable portion of saccharine matter, which is easily fermented under favourable circumstances, when the tree is green or newly felled; and not secure from it when more seasoned. In confined situations, as in the constructions of a building, and when the wood is green, a great degree of fermentation always takes place, and the atmosphere in this situation not having sufficient power to disperse and neutralise the gases evolved from such a state, they afford a direct pabulum to the fungous plant, which when fecundated, grows and spreads itself over the surface of the wood, walls and every contiguous substance. Oak-wood is not so soon infected as the fir, nor when it is, is it so rapidly destroyed; which perhaps is the cause why in France so little has been written concerning it, in which country they generally employ it in their buildings; but that it does suffer, as well as other woods, from this rot, there is abundant proof in our own houses when it happens to be employed in them, as well as in our ships: to prevent it in the latter of which, as well as in the former, numerous experiments have been tried with very little or no benefit to the public. Some buildings have it from the locality of their situations, others from the nature of the material employed, and some from a too rapid finishing. When it takes place from situation, viz. damp-walls near the earth's surface, it is generally if not universally occasioned by the percolation of water from the higher adjoining grounds, which thus intercepted in its current attempts to follow the general hydrostatic law of elevating itself by the syphon line, to a height equal to that from whence it had its origin. Drains made athwart the ascending ground, with very little descent or fall, and made of the depth of one yard for each yard of ascent, and from the foundation, until equal to the height that such damp ever rises, would in most cases prove a prevention for the dry-rot where it originated from extreme moisture. When the cause arises from the state of the material, or from the too rapid finishing, or indeed any other stimulus, the effectual remedy is to char, or carbonise the surface of the wood, which may be easily done in as far as concerns the timbering of a building by exposing it to the operation of fire, and this may be very much facilitated by previously washing the surface with a solution of nitre, and this process would still be more complete, if the wood was slightly wrought or planed. At a villa in the neighbourhood of London, in which this rot had been discovered by protruding itself through the skirting, dado, &c. of the principal rooms; these having been removed as well as the flooring boards, the girders and other timbers were found in a state of decay, so much so, that it was deemed expedient to remove the whole, which having been done, the new timber, with such of the old as was found fit to be replaced, were all well charred, as also the flooring boards, which being only partially infected, it was not deemed necessary to replace by new ones, and in addition to their being charred they were washed with a solution of the sulphate of iron. This repair has now been made several years, in a situation too of extreme moisture, and where the dry-rot had been almost an annual visitor, and was effected at much less expense than any previous repair for it, in consequence of much of the old wood having been charred and replaced, which was never done in previous repairs. Gloster Lodge has since been also repaired for this rot, adopting, as far as its timbering was concerned, the mode of preparing it herein recommended, and if builders in general were to aspire to a praise so heroic as that of disinterestedness, and make use of it for their employers in cases which come under their notice, scenes of decay destructive of some of the best structures the country can boast, would be avoided. It might be also employed to secure the timbering of our ships; it offers every facility, by the assistance of chemistry, of being accomplished to the slightest material made use of. It is well known that most of the acids possess the power of charring in proportion to the force with which they retain their oxygen. Charcoal has long been known as indestructible; the ancients were acquainted with it, as is obvious from the piles on which the famous Temple of Ephesus was built having been so prepared, nor have there been wanting instances within our own knowledge. This indestructibility given to wood by charring, arises, according to Dr. **Bancroft**, from its absorption of oxygen, in which state he remarks it will resist the combined action of the sun, air, and moisture for hundreds of years. Dr. **Parry** also observes "that he had read that charcoal buried in the moist earth had come down to us perfectly sound from the times of the Romans, and that posts long withstood the same moisture, if the part intended to be put into the ground was charred all round to a certain depth. Impressed with these facts, he determined to try an artificial coat of charcoal; and when new water shoots were constructed, he strongly and carefully rubbed them with a coat of drying oil, which he dredged all over with a thick layer of charcoal finely powdered and contained in a muslin bag. After 2 or 3 days, when the oil was thoroughly dry, and firmly retained the greatest part of the charcoal, he brushed off what was loose, and over that which adhered, a coat of common paint was applied, and in a few days after, a second; the whole became a firm and solid crust, after which the shoots were put into their places, and being examined many years afterwards appeared perfectly sound. He does not think lamp-black, which is a pure species of charcoal, would have answered the purpose of forming a thick defensive covering so well as the grosser charcoal which he used; but whatever sort of charcoal is employed, it ought either to be fresh made, or heated again in close vessels, so as to expel the water which it greedily attracts from air. This was an ingenious contrivance by way of experiment, but the shoots might have been charred; but if charcoal put on in this way protects the surface on which it is applied, very beneficial results would be derived in cases of dry-rot by adapting it to all light wainscoting and other wood-work which is fixed to walls, where charring by the common mode might warp and injure it. Dr. **Darwin**, who was fond of speculating, "supposed that the rot of wood might be entirely prevented by soaking dry timber first in lime water, till it had absorbed as much of it as may, and then after it is dry by soaking it in a weak solution of vitriolic acid in water; which will unite with the lime already deposited in the pores of the timber, and convert it into gypsum: which he supposes will not only preserve it from decay for many centuries, if it be kept dry, but also render it less inflammable. He also conceives that beams so impregnated would be less liable to swag, and boards so prepared less liable to warp." In the immense salt mines of Hungary, many large wooden props which support the roof, and are perpetually moistened with salt water trickling down them, are said to have suffered no decay for many centuries.

In the *Transactions of the Society for the Encouragement of Arts*, we meet with the following account of the cause of the dry-rot in timber, and the method of preventing it, communicated by **Robert Batson**, of Limehouse, Esq. He observes, that the dry-rot having taken place in one of his parlours, to such a degree as to require the pulling down part of the wainscot, every third year; and perceiving that it arose from a damp stagnated air, and from the moisture of the earth, he determined, in the month of June, 1783, to build a narrow closet, next the wall through which the moisture came to the parlour: this expedient had the desired effect. But, though the rot in the parlour was totally stopped, the evil soon appeared in the closet, where fungi of a yellow colour arose in various parts. In the autumn of the year 1786, the closet was locked up about ten weeks: on opening it, numerous excrescences were observed about the lower part; a white mould was spread by a plant resembling a vine, or sea-weed; and the whole of the inside, china, &c. was covered with a fine powder of the colour of brick dust. On cleaning out the closet, it was discovered that the disease had affected the wood so far as to extend through every shelf, and the brackets that supported them. In the beginning of the year 1787, he determined to strip the whole closet of lining and floor, not to leave a particle of the wood behind, and also to dig, and take away, about two feet of the earth in depth, and leave the walls to dry, so as to destroy the roots or seeds of the evil. When, by time, the admission of air, and good brushing, it had become properly dry and cleansed, he filled it of sufficient height for the joists, with anchor-smith's ashes; because no vegetable will grow in them. The joists being sawed off to their proper lengths, and fully prepared, they and the plates were well charred, and laid upon the ashes; particular directions being given, that no scantling or board might be cut or planed in the place, lest any dust or shavings might drop among the ashes. The flooring-boards being very dry, he caused them to be laid close, to prevent the dust getting down, which, perhaps, in the course of time, might bring on vegetation. The framing of the closet was then fixed up, having all the lower pannels let in, to be fastened with buttons only, so that, if any vegetation should arise, the pannels might with ease be taken out, and examined.

In some situations, it might be expedient and necessary to take out a greater depth of earth; and where ashes can be had from a foundry, they may be substituted for those of anchor-smiths; but house-ashes are by no means to be depended upon.

At the expiration of seven years from the period of making this experiment, the wainscot was removed, and the flooring boards also taken up, when they were found entirely free from any appearance of the rot: two pieces of wood (yellow fir) which had been driven into the wall as plugs, without being previously *charred*, were alone affected with this disease.

We shall close this article, by inserting the following "Means of curing the Dry Rot," extracted from the *Analectic Magazine*, for Nov. 1818.

First. Make a strong caustic solution in water of barilla, kelp, or potash, and when boiling hot, wash the parts of the wood affected with the rot. The effect of this caustic ley will be the destruction of the vegetating fibres of the fungus.

Secondly. Dissolve oxide of lead or iron in pyrolignous acid; and twelve hours after the first application of the ley soak the wood well with this solution. A decomposition of the metallic liquor takes place; the acid and alkali unite, and the oxide of the lead or iron is precipitated in the pores of the wood, and prevents the fungus from spreading.

Another way of preventing the rot is, first, to wash the wood with the pyrolignous solution of lead, and ten or twelve hours after to wash it with a strong solution of alum (in the proportion of one pound and a half of alum to one gallon of water).

DUCK, The Wild, (*Anas boschas*) is distinguished by the general cinereous colour of its plumage, by having a narrow white mark round the neck, the bill being straight, and the tail feathers of the male curved upward.

The male is called *mallard*, or *drake*, and the female has the name of *duck*.

Wild ducks are very common in most of the fenny parts of England, and are also found on the continent of Europe, in Asia, and America.

One mode of catching wild ducks in the fens of Lincolnshire and some other countries is by what are called *decoys*. These are ponds generally in marshy situations and surrounded with wood or reeds, and if possible with both. The wild birds are attracted into nets placed in the ditches of the decoy, by ducks trained for the purpose, and called decoy-birds. The latter fly abroad, but regularly return for food to the pond of the decoy, where they mix with tame ducks which never quit the place. When it is required to catch the wild birds a quantity of hempseed is thrown into the ditches. The decoy and tame ducks lead them, in search of this, along the ditches, which generally have reed-skreens at certain intervals on each side, to prevent the decoy-man from being seen. And as soon as they have advanced to the part of the ditch over which the net is extended, the man appears behind. Fearful of returning past him, and unable to escape by flight, they proceed onward to the end of the net which terminates on the land, and are there caught by a man stationed at hand for the purpose. The trained birds return back past the decoy-man into the pond again. The general season for catching wild ducks is from the latter end of October until the beginning of February; and we are informed that in ten decoys which are near Wainfleet, as many as 31,200 wild ducks, wigeon, teal, &c. were caught in a single season.

These birds are the original to which we are indebted for our valuable breed, the common or *tame duck*.

The *Teal* and *Wigeon*, (*Anas crecca* and *penelope*), are two small species of duck, of which the former has a green spot on each wing, and a white line about and beneath the eyes; and the latter has the tail somewhat pointed, the under part near the tail black, the head brown, the front white, and the back waved with ash coloured and blackish marks.

Both these species are common in England, and are killed for the table.

The *Eider Duck* (*Anas mollissima*,) is about twice the size of the common duck, and known by its bill being cylindric, and the cere or naked skin at the base being divided into two parts at the back, and wrinkled.

These birds inhabit the northern parts of Europe, Asia, and America, and generally form their nests on small islands not far from the sea shore.

The nests of eider ducks are constructed externally of marine plants, and lined with white down, which the birds pluck from their own breasts. This is the substance called *eider down*. It is collected from the nests by the bird-catchers, who for that purpose carefully remove the females, and then take away a certain portion both of down and eggs from each. More down is plucked from their breasts, and more eggs are laid to supply the place of those that have been taken. The nests are plundered in the same manner as before, and when the young ones are fledged the whole of the down that remains is collected. It is generally reckoned that the down of one nest after it has been picked and cleansed will weigh about a quarter of a pound; and the bulk of the whole quantity may easily be imagined, when it is stated that three quarters of an ounce of eider down is more than sufficient to fill the crown of a large hat. The use of this down is for making beds, but particularly for making what are called down quilts, a kind of covering almost like a feather-bed, which is used in the northern countries of Europe as a protection against cold, instead of a common quilt or blanket.

The *flesh* and the *eggs* of these birds are used for food, and their *skins* are sewed together and made into under garments by the inhabitants of Greenland.

Tame Ducks are very useful for destroying the black caterpillars, snails, or slugs, which infest turnip fields: hence, if they are turned into such fields, they will devour all the insects, and do no injury to the crop.

It is remarkable, that ducks are extremely fond of the entrails of other animals, and almost every kind of filth. Hence their flesh, though much relished by the epicure, is of strong flavour

The *White-back*, or *Canvas-back Duck*, is more extolled for the delicious flavour of its flesh, than any other of the whole order of water fowl. It breeds in the north and north-west regions of the United States; and arrives on the Atlantic coast, towards the end of autumn. There they remain until the approach of warm weather. They are not found north of the Chesapeak bay: and are chiefly confined to the waters of the Susquehannah and Potomac. Formerly they were common on James's River, in Virginia, but lately they have deserted it altogether. This abandonment of residence, is supposed to be owing to a failure of the particular food which formerly invited them there This consists of the roots of a coarse long grass, which grows in the before mentioned rivers, higher toward their sources, than the salt water extends. And these roots which are large, succulent, and resemble those of cellery, are procured by *diving*. So powerful an effect has this food upon them, that one week before they begin to feed on this grass, their flesh is not in the least different from that of common ducks. And whenever ice covers the fresh water of the Susquehannah and Potomac, and forces the canvas backs to leave their feeding place, and go down to the salt water of the Chesapeak, they soon become lean, and their flesh loses all the excellence of relish for which it is so highly prized.

Method of fattening Ducks in France.

The ducks are of that kind called in *patois* Mule Ducks, which do not generate, and are produced by the great Indian drake and the common duck. In the autumn when tolerably fat, they are shut up eight by eight in a dark place, and crammed with boiled corn. They sometimes are suffocated, but if they are soon bled, they are not the worse for it. They pass fifteen days in a state of oppression and suffocation, which makes their livers grow large: when the tail spreads out like a fan, they are fat enough: they are then turned out to bathe, after which they are killed.

Two days after killing, they are opened below, and their wings and legs taken off, and the flesh covering the rump and stomach. The whole is put into a salting tub, with the neck and end of the rump, and left covered with salt for fifteen days; after which they are cut into four quarters and put into the pot. They are first seasoned with cloves, and other spices put in them.—Some leaves of Spanish laurel and a little salt-petre having been put in the brine to give the meat a red colour.

DUCTILITY, a property of certain bodies, whereby they are capable of being expanded, or stretched forth, by means of a hammer, press, &c. The great ductility of some bodies, especially of gold, is very surprising: the gold-beaters and wire-drawers furnish us with abundant proofs of this property: a single grain of gold may be beat into an extent of several square inches, and yet the leaf remain so compact, as not to transmit the rays of light, and Dr. HALLEY found that a small cube of gold, whose side is the 1-100th part of an inch only, contains 2,433,000 visible parts. M. REAUMUR shews that in the common way of drawing gold-wire, a cylinder of silver 22 inches long and 1½ inch in diameter is stretched to 1,163,520 feet, or is 634,692 times longer than before, which amounts to about 97 leagues. To wind this thread on silk for use, they first flatten it, in doing which, it stretches one-fourth more, so that the 22 inches are now extended to about 120 leagues in length. Glass is also very ductile, and may be spun out into exceedingly fine threads. Our ordinary spinners do not form their threads of silk, flax, &c. with half the expedition as the glass-spinners do threads of this brittle matter. The method of performing this is as follows: There are two workmen employed; the first holds one end of a piece of glass over the flame of a lamp, and when the heat has softened it, a second operator applies a glass hook to the metal thus in fusion, and, withdrawing the hook again, it brings with it a thread of glass, which still adheres to the mass; then fitting his hook on the circumference of a wheel about 30 inches in diameter, he turns the wheel as fast as he pleases; which drawing out the thread, winds it on its run, till it is covered with a skein of glass-thread. The mass in fusion over the lamp, diminishes insensibly, being wound out like a clue of silk upon the wheel; and the parts, as they recede from the flame, cooling, become more coherent to those next to them, and this by degrees: the parts nearest the fire are always the least coherent, and of consequence must give way to the effort that the rest make to draw them towards the wheel. It is said that the flexibility of glass increases in proportion to the fineness of the thread, and that, probably, had we but the art of drawing threads as fine as a spider's web, we might weave stuffs and cloths of them for wear.

DUEL, a single combat, at a time and place appointed, in consequence of a challenge. This custom originated with the northern nations of Europe, among whom it was usual to decide all their controversies by arms. Both the accuser and accused gave pledges to the judges on their respective behalves; and the custom prevailed so far among the Germans, Danes, and Franks, that none were excused from it but women, sick people, cripples, and such as were under 21 years of age, or above 60. Even ecclesiastics, priests and monks were obliged to find champions to fight in their stead. The punishment of the vanquished was either death, by hanging or beheading; or, mutilation of the members, according to the circumstances of the case. Duels were at first admitted, not only on criminal occasions, but on some civil ones for the maintenance of rights to estates, and the like: in latter times, however, before they were entirely abolished, they were restrained to these four cases: 1. That the crime should be capital. 2. That it should be certain the crime was perpetrated. 3. The accused must, by common fame, be supposed guilty. And 4. The matter not capable of proof by witnesses. In England, though the trial of duel is disused, the law on which it is founded was in force till abolished 1819 in consequence of the disgraceful proceedings in the Court of King's Bench, on wager of battle tendered on appeal of murder, by one Thornton. Taking away the life of a person, by deliberate duelling, is, by the law of that country, a species of murder; and, consequently, it charges the crime and inflicts the punishment of homicide on the principals, and likewise, according to the nature of the case, on their seconds. It has also been enacted, that challenges to fight, whether by word or letter, as well as the carrying of such messages, are punishable by fine and imprisonment. And, if they arise from gambling, the offender, by the 9 Anne, c. 14. incurs the forfeiture of all his goods to the crown, and an imprisonment for five years. [In America, in most of the States, duelling and challenging are severely punished; but differently in different states.—T. C.]

DUMBNESS, is the privation, or want, of the faculty of speech.

This unfortunate defect proceeds chiefly from total and native deafness; if it arise from a deficiency in the organs necessary for uttering sounds, it is always incurable. Several instances, however, have occurred of persons born deaf, who have been taught to speak distinctly; to read, write, understand arithmetic, &c.

The most eminent teachers of the dumb in this country, were,

1. Dr. Wallis, who, in the 61st number of the *Philosophical Transactions*, gives an account of two persons he had taught to speak; and, in the 25th number of the same work, his method is explained.

2. Mr. Thomas Braidwood, late of Edinburgh, who is perhaps the first person that ever brought the surprising art of imparting speech to dumb persons to any degree of perfection. He first commenced his useful labours in 1764, and, in the course of a few years, enabled many to speak, write, &c. We regret that we cannot communicate a clear idea of this method, which indeed will not admit of being so fully explained in writing, as to enable any person to teach it. Mr. B. used to pronounce first the sound of *a*, slowly, at the same time pointing out the figure of that letter, and making his pupil watch the motion of his mouth and throat; he then put his finger into the pupil's mouth, depressing or elevating his tongue, and making him keep the parts in that position. Next, he laid hold of the outside of the wind-pipe, and squeezed it in a certain direction, which we confess ourselves utterly unable to describe. While he was pronouncing the letter *a*, his pupil was anxiously imitating him, uncertain of, or rather not comprehending, the nature of the sound he was required to utter. In this manner, Mr. Braidwood proceeded, till his tyro learned to pronounce the sounds of the different letters of the alphabet. Mr. B. then continued in the same order to join vowels and consonants, till at length his pupil was enabled both to speak and read.

It would be injustice to omit mentioning the labours of the very ingenious Abbe L'Epee, of Berlin, who has deservedly acquired great celebrity by his method of teaching dumb persons to speak, by signs or characters. For an account of his plan, we must refer our readers to the "*New Memoirs of the Royal Academy of Sciences*," &c. of Berlin for the year 1795, ("*Nouveaux Memoires de L'Academie Royale*," &c.) in which they will find a short account confirmed by facts. Since his time the art of teaching the deaf and dumb has been carried to great perfection by the Abbe Sicard at Paris.

DUNG, properly signifies the excrements of animals, together with the litter. It likewise comprehends whatever will ferment with soil, such as the green stalks of leaves and plants, when buried in the earth, &c.

The value and use of the dung of most animals, are sufficiently proved by experience.

The quality of the dung of different animals depends in a great measure on the richness, or poverty, of their food. Thus, if cattle be fed on lint, rape, or other oily seeds, it will be of the most fertilising nature: the dung obtained from those kept on oil-cake, is next in value; then succeeds the manure produced from animals subsisting on turnips, carrots, parsnips, potatoes, or other succulent roots: next in effect, is that resulting from the best *hay*; after which follows that of cattle supplied with *ordinary* hay; and the poorest is that obtained from straw. It deserves to be remarked, that the dung of *fat* animals is unquestionably richer, and consequently contributes more to fertilization, than that of *lean* creatures; which, if worked hard, and fed on straw, "is poor indeed."

In the county of Middlesex, where all the produce of land is sold at very high prices in the markets of the metropolis, the soil is kept in *good heart*, by the immense quantities of dung which are brought in the carts on their return; because no cattle, though fed in home-stalls, can produce so large a supply. [Nor is night-soil neglected in the grounds about London. Mr. Middleton states it as beyond all comparison the best of all manures. In China, as we find from Barrow, it is constantly used, and never wasted.—T. C.] But, in counties that are more remote from London, the most effectual mode of manuring, in the opinion of Mr. Middleton, consists in raising green crops, for the purpose of feeding sheep and bullocks on the land. This, says he, is the only method, by which the loss of nearly all their urine can be prevented: for there is a great waste, equal perhaps to one-half, in the stables, cow-houses, sheds, fold-yards, and dunghills of farms, even though conducted in the most careful manner; but, in those which are under ordinary management, such loss amounts to three-fourths; whereas no waste can possibly arise, when cattle are soiled on tares, clover, &c. in the field; the whole being immediately applied to the amelioration of the land, without incurring the expense of conveyance. We do not pretend to decide on the practicability of this plan; which, in many situations, may be applicable to a considerable extent, and attended with great advantages: on the other hand, we are firmly persuaded, nay convinced, from the experience of able and successful farmers on the continent of Europe, that *stall-feeding, with cut hay and straw, is one of the greatest improvements made in modern husbandry*.

[*It is now settled*, that all stable manure should be used as fresh as possible, not rotted; and ploughed in as soon as possible that its juices may not be exhaled by the sun and air.—T. C.]

However excellent dung is from its own nature, it acquires additional vigour, if mixed with lime, in the proportion of one-fourth of the latter, to three-fourths of the former. By this means a smaller quantity of manure is consumed; the seeds of weeds, where this composition is laid on, are effectually destroyed; and the fermentation of the dung promoted, which consequently heightens its fertilising properties. See Manure.

The sorts of dung which are, or may be used, are that of black cattle, sheep, horses, swine, goats, hens, pigeons, ducks, geese, and rabbits, besides human ordure.

The dung of sheep is fit for cold, heavy lands. Perhaps the best way of applying the dung of sheep to land is by folding, by means of hurdles, especially in countries which are not infested by wolves. For in this method their urine is all saved, as well as their dung. But it ought to be turned in with the plough as soon as possible, that the sun and air may not deprive the land of it.

[The portion of the field enclosed by hurdles, should be oblong with a narrow end, to save trouble in removing the sheep, from one part to another.—T. C.]

In Flanders it is the practice to house their sheep at night, under slight sheds, the ground being spread with dry sand, about four or five inches thick, laying on a little more fresh every night. This is cleared out once a week, and carried to a dung-hill, or applied to the soil. This mixture of sand and hot dung, makes a very excellent dressing for cold and stiff land. For there is scarcely a richer manure than the dung and urine of sheep. M. QUINTINIE thinks it the greatest promoter of fruitfulness, in all sorts of ground. This method of folding sheep in a covered fold, and of mixing their dung with earth or sand, according to the nature of the soil it is intended for, is with much reason recommended.

If a light soil is intended to be manured with this compost; instead of sand, clay, pond-mud, or the mud of flats, or loam, may be used; these substances having been first mellowed by the frosts of winter.

Horse-dung is a hot manure, as appears by its quick fermentation in heaps, even in cool weather. It is consequently fittest for hot-beds, when it is new. The dung of horses that are fed on grain, is a richer manure than those fed on only grass and hay.

Great care should be taken that horse-dung be not spoiled, by being over-heated, or burnt in the heaps, before it is used. For in this country it is very commonly the case. When it has been so heated as to give it a white and mouldy appearance the virtue of it is gone. It is difficult to give it age, without mixing it with other substances. A mixture of horse and cow-dung is very proper for land that is neither too light nor too stiff.

The dung of swine is a rich and fat manure, and adapted for the growing of hops, pumpkins, potatoes, running beans, and every plant which has long vines. It answers well, when mixed with a large proportion of earth, weeds, straw, or other bibulous substances. It is almost incredible how great a quantity of good manure may be obtained, by supplying a hog-sty with rubbish to mix with the dung.

The dung of ducks and geese is deemed too hot and burning. But if the farmer would gather it in a heap, and mix it with the dung of cattle, he would bring it to a temperate heat, and draw from it such advantage as would indemnify him for the pains he should take. Hen-dung is scattered in small quantities upon land intended to be sown, but on account of its heat is never used, unless when rain is foreseen. It is an excellent manure for meadows. Pigeon's dung is much the same with that of poultry, the only difference being its superior heat." [The dung of fowls and of dogs is greatly used in the preparation of morocco leather.—T. C.]

I should think it better to mix the dung of poultry and pigeon's with other substances, to allay their heat, before they are applied to the soil. And thus qualified, they would be an excellent top-dressing for corn, especially in cold and wet lands.

[Human ordure is the strongest and most efficacious of all manures, and therefore may be used in small quantity, either by itself, or mixed with earth, or out of a watering cart.—T. C.]

When the farmer has carted his dung-heaps away from the sides of his barn, he should take up an inch or two of the surface of the ground beneath; because much of the strength of the dung and stale has passed into it, and made it a good manure. [This should be renewed by a layer of fresh earth.—T. C.]

When dung is applied to tillage-land by folding, it should be mixed with the soil, by the plough, or the harrow, every two or three days, if the weather be dry. Or it may be done with the hoe or shovel. In cloudy or rainy weather, it will not need mixing so often. If this method be observed, much will be saved: and half the time that yards are commonly folded, will, if I mistake not, be sufficient to fit them to produce a good crop.

Our farmers seem to think it a matter of great importance to put dung in holes under the seed, especially to produce a crop of Indian-corn. Nothing makes this tedious and laborious method needful, unless it be a scarcity of manure, as less will answer for one single crop, than is required in the other way. The corn does not commonly come up so well, and it is more in danger of being destroyed by worms. If six or eight loads of dung will cause an acre to produce more corn when put in holes, than if it were ploughed in, as it undoubtedly will; yet it should be remembered, the land will not be in so good heart the year following; will not produce so good a crop of grain, nor be in so good order to lay down to grass. So that, perhaps, in a course of crops, it may be found that the labour of dunging in the holes may be spared, excepting, perhaps, in green sward ground. If so, the farmer might redeem time by it, and at a season when his hurry of business is greatest.

The following judicious method of raising dung-hills, is practised in the county of Middlesex: it justly claims the attention of those farmers, who find it necessary to collect dung, for the use of their lands. First, all the scrapings of roads, the mud of ponds and ditches, and the top-mould from gravel-pits, are spread in the most convenient places, as *bottoms for dung-hills.* On these strata is carted the whole of the dung produced on their own farms, together with all that can be procured from the metropolis, and the different inns on the road; to which are sometimes added chalk, ashes, soap-boilers' waste, brick-layers' rubbish, &c.

In this state, the heap remains till within a month of the time for spreading manure on the land; when the whole is turned, and intimately mixed; the larger clods are then broken into small pieces, while such as may be too dry, are thrown into the middle. Thus treated, the mass unites more perfectly; and the putrefaction will be completed, while the matters continue in a heap. By this mode of forming the basis of dung-hills, the fertilising liquor (that distils from the dung during the fermentation and heat which necessarily take place) is effectually preserved, and contributes greatly to the amelioration of the soil. [Dung should be used fresh if possible.—T C.]

DUNKERS, or **TUNKERS**, a sect of Christians peculiar to America, which arose about the year 1724, and formed a kind of commonwealth, the principal seat of which is Pennsylvania. The dunkers baptise by immersion; dress like Dominican friars; never shave their heads or beards; have different apartments for the two sexes, and they subsist chiefly on vegetables. Their principal idea of discipline is the mortification of the body; and doctrinal tenet, the denial of the eternity of punishment. Their common appellation, *harmless dunkers*, conveys an idea of their character in two words.

DUODECIMALS, in arithmetic, are numbers proceeding in a proportion of twelves; in the same way as decimals proceed in a proportion of tens. This way of conceiving an unit divided is chiefly in use among artificers, who generally take linear dimensions of their work in feet, inches, and twelfth parts of an inch. In sqauring their dimensions, duodecimals are multiplied into duodecimals, and the operation is called *cross-multiplication.* RULE: Under the multiplicand write the corresponding denominations of the multiplier: multiply each term in the multiplicand, beginning at the lowest, by the feet in the multiplier, and write the result of each under its respective term, observing to carry an unit for every twelve, from each lower denomination to its next superior. In the same manner, multiply all the multiplicand by the prime in the multiplier, and set the result of each term one place removed to the right hand of those in the multiplicand. Do the same with the seconds in the multiplier, setting the result of each term two places removed to the right hand of those in the multiplicand. Proceed in like manner with all the rest of the denominations, and their sum, when added together, gives the answer: the following example will illustrate the rule:

ft in. ″ ft. in. ″
Ex. multiply 9 9 4 by 3 4 3
3 4 3
29 4 0
3 3 1 4‴
2 5 4 0⁗

Ans. 32 9 6 8 0 Feet.

DUTCH-GOLD. Brass hammered out into thin plates about 6 or 8 times as thick as gold leaf.

DYEING, the art of giving a lasting colour to silks, cloths, and other substances, whereby their beauty is much improved, and value enhanced. This art depends chiefly on three things, viz 1. Disposing the surface of the stuffs to receive and retain the colours, which is performed by washing them in different leys, digesting, beating, &c. by means of which the viscous gluten of the silk-worms naturally adhering to their threads, is washed and cleansed from them, and thus they become fitted gradually to imbibe the colours. By these also the greasy foulness adhering to wool and flax is scoured off. 2. So to grind the colours, as that they may enter the body duly prepared, and preserve their brightness undiminished. 3. The third consists in having beautiful colours.

Dyeing, properly so called, is a chemical process, and in order that it may succeed, it is necessary that the colouring matters should be dissolved in some fluid, and that their attraction to that fluid should be less than that to the stuff. The stuff receives the dye better in proportion to the degree of affinity which the colouring matter has to it, and to the solvent relatively, for if the attraction to the stuff is much more than to the solvent, the stuff receives the dye too rapidly; if on the other hand its attraction to the solvent is too great, the stuff will either not take the dye at all, or it will take it very slowly and faintly. Wool has a stronger attraction for colouring matters than silk, silk than cotton, and this latter a stronger than linen. The essential circumstances in dyeing are to ascertain the affinities of the colouring substance; first, to the solvents; secondly, to those substances which modify its colour, increase its brilliancy, and strengthen its union with stuff; thirdly, to the different agents which may change the colour, and principally to air and light. In dyeing, the title of *Mordant* is applied to those substances which serve as intermedia between the colouring particles, and the stuff to be dyed, either for the purpose of facilitating, or of modifying their combination, and by their means colours are varied, brightened, made to strike, and rendered more durable. If a sufficient number of colouring matters could be procured which had an affinity to cloth sufficient to answer all the purposes of dyeing, the art would be exceedingly simple and easy. But except indigo there is scarcely a dye-stuff which yields of itself a good colour sufficiently permanent to deserve the name of a dye. This difficulty is obviated by employing an intermediate substance, (mordant) which has a strong affinity both for the stuff and the colouring matter, and this is the chief purpose for which the mordant is used. The principal substances employed as mordants are aluminous salts, lime, metallic oxides, some astringent substances, and animal matters. The three simple colours in dyeing are red, yellow and blue; all other colours are compounded of these. Different shades or tints of the same colour are produced by using different drugs, or by varying the quantity of colouring particles, or in the case of compound colours, by varying the proportion of the different simple ones, of which they are composed.

Dr. Willich says there are five colours which the workmen call primitive, viz. *blue, red, yellow, fawn* or *root* colour, and *black*.

The ingredients used in dyeing *blue* consist of pastel or woad, and indigo.

1. Pastel, or Woad, (*Isatis tinctoria,*) is prepared by gathering it when ripe, suffering it to rot, and then working it up into balls for drying; which weigh in general from 150 to 200 pounds, and resemble a collection of small dry lumps of earth, intermixed with the fibres of plants. In order to extract the colour, it is necessary to provide large wooden vats, from 12 to 16 feet in diameter, and 6 or 7 feet high, or of a magnitude proportioned to the quantity intended to be used. The preparation of the blue-vat is the most difficult process in the art of dyeing; and the practical directions given by those who understand it, are either defective, or mis-stated. The copper-cauldron should be placed as near to the vat as possible, and filled with pond-water; to which, if it be not sufficiently putrid, may be added 2 or 3 pounds of hay, together with 8 pounds of brown madder, or of the bark of the root. The fire should be lighted about three o'clock in the morning, and the mixture boil for an hour and a half, or two hours, when the liquor is, by means of a spout, conveyed into the vat, in which a peck of wheaten bran is previously infused. The pastel-balls are next to be put in, separately, while the liquor is running into the vat, in order that they may be the more easily broken and stirred with the rake, which is a semi-circular wooden instrument, having a long handle. The mixture is occasionally agitated, till the vat has received all the hot liquor; and, as soon as the vessel is nearly half full, it should be covered with a lid, somewhat larger than its own circumference. A cloth should be likewise thrown over it, in order to confine the heat; after which the whole should be suffered to subside for four hours; when it ought to be uncovered, in order to give it air, and to mix it thoroughly. No *lime*, as is generally, though falsely, directed by dyers, should be put into the vat, but a small air-hole left on the top: the stirring and agitation may once more be repeated, at the expiration of three or four hours.

If the ingredients, after these operations, be not yet ready and *come to*, that is, if the blue does not rise to the surface, but continues to foam, it will then be necessary, after working the mixture well, to let it stand an hour and a half longer, care being taken during that time to observe it minutely, in case it should *cast blue*. The vat is then to be filled up with water, and a sufficient quantity of indigo, dissolved in a ley of pot-ash, pure water, bran and madder. The vat being again covered, at the end of three hours a pattern is to be immersed in the liquor for a similar space of time, when it is to be taken out, to inspect the state of the vat. This pattern, when first taken out, should be of a green colour, but instantly turn blue; if the green be bright and good, the vat is to be stirred again, and then covered up, with the addition of a few handfuls of bran. Three hours after, the same operation is to be repeated, with the addition of more bran, if necessary, when it is to be covered up for an hour and a half longer: and, as soon as it subsides, another specimen is to be immersed in it for an hour, when it must be examined, to ascertain the state of the pastel. If the former be of a good green, when taken out, and turn suddenly to a deep blue, on being exposed to the air, another pattern is to be put in, to discover the effect of the vat; which, if the colour be sufficiently high, is to be filled with hot water, or (which is preferable, if it can be procured), with the liquor of an old madder-vat, and then stirred again. Now the vat is to be once more covered for an hour; after which the stuffs to be dyed should be immersed.

Indigo is the last ingredient in dyeing blues. The vat is about 5 feet high, two inches in diameter, and somewhat narrower towards the bottom, being surrounded by a wall, and having a vacancy for the embers. A vat of this size requires from 2 to 5, or even 6 lbs. of indigo; and this operation is conducted as follows: 1. About 15 gallons of river water are put into a copper to boil for about half an hour, together with 2 lbs. of pot-ash, 9 oz. of madder, and a handful of bran. 2. Immerse 2 lbs. of indigo in a pail of cold water, in order to separate the solid from the volatile particles, which will immediately rise to the surface. The watery liquor is then poured off, and the indigo, settled at the bottom of the pail, should be triturated in an iron mortar, with the addition of a small quantity of hot water, that ought to be shaken from side to side; and the floating particles of indigo, which are those most finely pounded, must be poured into another vessel. In this manner, the indigo remaining in the mortar is continually reduced, fresh water being repeatedly added, till the whole is pulverised so finely as to rise to the surface.

The liquor which had, during the above stated preparation, been boiling in the copper, is now poured into the vat, together with the indigo, when the whole is well stirred with a rake, the vat closely covered, and surrounded with embers. If this operation commence in the afternoon, the embers must be renewed in the evening, and also in the morning and evening of the following day, in the course of which it should be twice gently stirred. Similar measures ought to be pursued on the third day, in order to preserve an uniform heat, and intimately mix the ingredients. A brassy scum will then be perceived to rise to the surface, in several detached parts: by continuing the heat on the fourth day, the scum becomes more coherent; and the froth, occasioned by stirring the liquor, appears blue, while the latter is of a deep green. As soon as it assumes this appearance, the vat should be filled: for which purpose a fresh liquor must be prepared, by putting five gallons of water into a copper, together with a pound of pot-ash, and half an oz. of madder. When these ingredients have boiled half an hour, the decoction is poured into the vat, the whole well stirred, and, if it produce much froth, it will be in a proper state for working the next day. This may likewise be ascertained by the brassy or scaly crust, which floats on the surface of the liquor: and, farther, if on blowing, or stirring, the latter with the hand, it assumes a deep green colour, while the surface appears of a brownish blue.

After the vats have been thus prepared, the dyeing of woollen or silken stuffs is very easy; no other process being required, than immersing them in warm water, wringing, and then steeping them in the vat for a longer or shorter time, according to the deepness of the colour intended to be imparted. The stuffs should be occasionally opened, that is, taken out of the vat, wrung over it, and exposed to the air for a minute or two, till it become blue: for it must be observed, that, in all the solutions of indigo, or other dyeing materials above described, the blue colour is produced only by exposure to the air, and the stuff, on being first drawn out of the liquor, always appears green, and will retain that tinge, unless it be exposed to the air. In dyeing blue, therefore, it is necessary to let the colour thus change previously to a second immersion, that the shade may be the better distinguished, as dark blues require to be repeatedly dipped. The method of dyeing cotton or linen blue, varies so little from that already described, as to render any farther directions unnecessary.

A beautiful *Saxon-blue*, for silk and woollen cloths, may be prepared by gradually pouring from five to eight parts of sulphuric acid on one part of finely pulverised indigo. The mixture must be suffered to stand for 24 hours; at the expiration of which, the effervescence will subside; the solution is then to be diluted with water, when it will be fit for dyeing.

2. The next of the primitive colours to be considered is RED, of which there are many shades and varieties; but the principal are scarlet, crimson, and madder red. The process to be adopted for obtaining these colours, essentially differs from that of blues; as the former require a peculiar preparation of the stuffs to be dyed, on the exactness of which, the goodness of the colour in a great measure depends. These preparatory ingredients consist of alum, tartar, aqua-fortis, or a solution of tin in this acid. Galls and alkaline salts are also sometimes added, though they do not materially contribute to the colour.

A fine *orange-yellow* tinge may be imparted to silk or cotton, by grinding anotta on a moistened slab, and boiling it in double its weight of pearl-ash and water: the liquor is then suffered to settle for about half an hour; when it is drawn off, while hot, into a proper vat, and the stuff immersed, till it acquire the requisite shade. In order to heighten and fix the colour, it will be proper to dissolve some cream of tartar in hot water, and to add the solution to the liquor, so as to render it slightly acid: after which, the stuff may be rinsed, and dried in the usual manner.

There are three kinds of *scarlet*, namely, that dyed with *kermes*, with *cochineal*, and with *gum-lac*.

The first of these, called *Venetian scarlet*, is the most permanent, but the least bright: it is also apt to be less spotted than the others; but, on account of the difficulty of procuring the insects which afford the colour, it is very seldom, if ever, used.

The second kind of scarlet, namely, that dyed with *cochineal*, is less permanent than the Venetian scarlet, though the drug is procured at a more reasonable price. It is, however, very difficult to dye the true cochineal scarlet: the success of this operation equally depends upon the choice of the material, the water employed, and the method of preparing a solution of tin, which is the only ingredient by which that delicate colour can be produced. To eight ounces of spirit of nitre, an equal quantity of river-water is to be added; in this mixture are to be gradually dissolved, half an ounce of the purest and whitest sal-ammoniac, and two drachms of purified salt-petre. An ounce of tin, reduced to grains, by being dropped into cold water while melting, is next to be added drop by drop to the liquor thus prepared; the first being perfectly dissolved before a second is introduced. The solution resembles that of gold, and, if fine tin be employed, will be perfectly transparent, without any dust or sediment. With this liquor are to be mixed such proportions of cochineal as may be thought proper, and the stuffs dyed in the colour will acquire a most beautiful scarlet.

The scarlet produced by *gum-lac*, though not so bright as cochineal, is more permanent; the best lac is that which is of a blackish brown colour on the outside, and white within. The process of preparing this colour is very difficult; but the best method, we believe, is that of previously mixing the gum with comfrey, or other mucilaginous roots. These should be dried, finely pulverised, afterwards boiled for fifteen minutes in the proportion of half a drachm to a quart of water, then strained through a linen cloth while hot, poured upon levigated gum-lac, and passed through a hair-sieve. The whole is then digested in a moderate heat for twelve hours; and the gum remaining at the bottom should be stirred seven or eight times. The liquor thus impregnated with a fine crimson colour, is afterwards poured into a vessel, sufficiently capacious to hold four times the quantity, and filled up with cold water. On adding a small proportion of a strong solution of alum, the coloured mucilage subsides; and, should any tinge remain in the liquor, it may be precipitated by gradual additions of alum, till it become perfectly colourless. As soon as the crimson mucilage has entirely subsided, the clear water must be carefully decanted, the remainder filtered, and the fluid parts suffered to evaporate. If the whole of the colour should not be extracted by the first operation, it ought to be repeated, till the residuum changes to a pale straw-colour.

In order to dye scarlet with this extract of gum-lac, the requisite proportion of the latter dried and pulverised, is to be put into an earthen or block-tin vessel; a little hot water poured upon it; and, when it is well moistened, a proper quantity of the composition added; the whole being stirred with a glass pestle. By this means the powder, which before was of a dark, dusky purple, acquires an exceedingly bright scarlet colour. A solution of the crystals of tartar is then to be poured into the liquor, and as soon as it begins to boil, the cloth is to be repeatedly immersed in it, according to the common method. The remainder of the operation is to be performed in the same manner as if cochineal had been employed.

Crimson is the colour produced by cochineal, with alum and tartar only, without any solution of tin. For this dye, two ounces and a half of alum, with an ounce and a half of white tartar, are to be taken, for every pound of wool; and being put into a cauldron with a proper quantity of water, the solution should boil before the stuff is dipped. The wool is then immersed into the boiling liquor, where it continues two hours; after which it is to be taken out, wrung gently, rinsed in water, and put into a bag. A fresh liquor is next prepared for the dye, in which an ounce of finely-powdered cochineal is used for every pound of wool: when this decoction boils, the stuff is immersed, and managed in the manner already directed for scarlet. For producing the finest crimson dye, however, the wool is again to be dipped in a weak lixivium, made of equal parts of sal-ammoniac and pearl ashes.

The preparation of the ingredients for *madder*-red is always with alum and tartar, the proportions of which are by no means ascertained even by dyers. The more general practice is, to put 5 ounces of alum and one of red tartar to every pound of worsted, a twelfth part of acid water being likewise added, and the wool boiled for two hours in this solution, in which worsted is to be kept for a week; but cloth will be sufficiently saturated in four days. A fresh liquor is then prepared for dyeing this wool; and when the water is nearly boiling, half a pound of the finest madder is to be thrown in for every pound of wool; being carefully stirred and well mixed in the copper, previously to immersing the stuff, which is to be kept in the liquor for an hour; during which the latter must not boil, lest it should tarnish the colour.

The third primitive colour is YELLOW, for obtaining which there are ten different ingredients; but four of these only yield a good and permanent dye, namely, dyers'-weed, or, as the dyers call it, weld, savory, dyers' green-weed, and fenu-greek. The first of these, namely, *weld*, in general affords the truest yellow, and is therefore preferred to all the others. Savory and dyers' green-weed, being naturally somewhat green, are more advantageously employed for dyeing that colour; and the last yields different shades of yellow.

In order to dye worsted and stuffs yellow, they undergo the usual preparation with tartar and alum: of the latter 4 ounces are allowed to every pound of wool, or 25 lbs. to every 100; of the former, one ounce is sufficient for yellow; after dissolving both, the wool is boiled in the same manner as in the preceding colour. A fresh liquor is next to be made for the *welding* or *yellowing*, in the proportion of 5 or 6lbs. of dyers'-weed to every pound of stuff. Some inclose the drug in a clean woollen bag, to prevent it from mixing with the cloth to be dyed; and, in order to keep the bag down in the copper, they lay a cross of heavy wood over it.—Others boil the weld in the liquor, till the water has imbibed all its colour, and the drug sinks to the bottom, when the stuff is suspended in a net: others, again, take the weld out, as soon as it is boiled. According to the shade required, other vegetables are occasionally mixed with that drug. By varying the proportion of the salts employed, as well as the quantity of colouring ingredients, and the time of boiling, different shades may be produced.

The fourth primitive colour is that denominated by dyers the FAWN, or *root* colour. It is a kind of brown, and the process for dyeing it is widely different from those just described; the wool merely requiring a simple immersion in water, as already directed for blue. The materials employed consist of the green shell of the walnut, the root of the walnut-tree, the bark of alder, santal, or saunders-wood, sumach, and soot. The green walnut-shells are collected, when the nuts are thoroughly ripe; they are put into tubs or casks, which are afterwards filled with water, and are thus preserved till the succeeding year.

Santal, or saunders-wood, is much inferior to walnut-shells; because, if used in too large a quantity, it stiffens and consequently injures the wool. It is in general mixed with galls, sumach, and alder-bark, without which its colour could not be extracted: and though it yields very little with alum and tartar, it is nevertheless used in large quantities, on account of the solidity of its colour, which is naturally a yellow-reddish-brown.

The best of the different ingredients employed in dyeing fawn-colours, is the bark or rind of the walnut-tree. Its shades are uncommonly fine; its colours solid; and it renders the wool dyed in it flexible and soft. A cauldron half full of water is placed over the fire; and as soon as it grows warm, bark is added in proportion to the quantity of stuffs intended to be dyed, and the lightness or depth of the shades required. It is then boiled for about a quarter of an hour, when the cloths, being previously moistened with warm water, are immersed, frequently turned, and well stirred, till they have sufficiently imbibed the colour. They are aired, dried, and dressed in the usual manner.

Next to the rind or bark, the root of the walnut-tree is the best dye for a fawn-colour: it also affords a variety of shades, similar to those produced by the bark, for which it is frequently substituted. The root, however requires a different process: A cauldron is filled about three parts full of river-water, into which the root is immersed, after being tied up in a bag. When the liquor is very hot, the wool or stuff is plunged into it, repeatedly turned, and occasionally aired. The lighter stuffs are next to be dipped, till the colour is completely extracted. During this operation, proper care should be taken to prevent the liquor from boiling, as in such case the piece first immersed would imbibe the whole of the colour.

The process of dyeing with the bark of *alder*, is nearly the same as that pursued with walnut-roots: the boiling of it is at first not very material, as this drug very freely communicates its colour. It is chiefly used for worsteds, imparting shades darkened with copperas; and for wool that is not required to be very dark, as it equally withstands the effects of the sun and rain.

Sumach possesses nearly the same properties as the bark or rind of the walnut-tree; its colour is not so deep, somewhat inclining to green, but is solid and permanent. Where dark colours are required, sumach is frequently substituted for nut-galls, in which case a greater proportion becomes necessary. These different substances, however, are not unfrequently mingled together, and, as they are of a similar nature, and differ only in degree, it is easy to obtain various shades.

With respect to the method of compounding the different ingredients with pulverised *saunders-wood;* 4 lbs. of the latter are to be put into a copper, with half a pound of powdered nut-galls, 12 lbs. of alder-bark, and 10 lbs. of sumach. The whole is to be boiled, when a small portion of water should be added, to check the boiling: after immersing the cloth, stirring, and turning it repeatedly, it is aired, and washed in river-water. The quantities of these ingredients may be increased, or diminished, according to the depth of the shade required.

The last substance employed in dyeing the fawn-colour, is *soot*, which is not only less solid than the others, but also hardens, and imparts a very disagreeable smell to the wool, or stuff, dyed in it: it is therefore seldom, if ever used, unless the other ingredients cannot be easily procured.

The fifth, and last, of the primitive colours, is BLACK, which includes a great variety of shades. In order to impart a good black to woollen stuffs, they should be first dyed of as deep a blue as possible, which is called the *ground*, and is to be performed in the manner already directed. As soon as the cloth is taken out of the vat, it ought to be well washed in river-water, and afterwards scoured at the fulling-mill. Next, the dyeing process is performed as follows: For every cwt. of cloth, 10 lbs. of logwood cut into chips, and an equal quantity of Aleppo gall-nuts pulverised and inclosed in a bag, are to be put into a cauldron of a moderate size, where the whole is boiled for twelve hours in a sufficient quantity of water. A third part of this liquor is then to be poured into another cauldron, with 2 lbs. of verdigris, when the cloth is to be immersed for two hours, being repeatedly turned and stirred, the liquor in the mean time boiling very slowly, or rather, gently simmering. At the expiration of that time, the stuff is to be taken out, and the second part (being another third) of the liquor added to the first third, together with 8 lbs. of copperas. The fire beneath the cauldron is then to be diminished, and the copperas left for half an hour to dissolve; the liquor being gradually cooling: after which the cloth is to be immersed for another hour, repeatedly turned as before, then removed and cooled.

The remainder of the liquor is next to be mixed with the first two-thirds and the bag carefully expressed; when fifteen or twenty pounds of sumach are to be added, together with two pounds of copperas. The whole is then made to boil: and, a small quantity of water being added to cool, the stuff is again immersed for two hours; at the end of which time it is to be taken out, cooled, and steeped in the dye for an hour longer, being frequently turned. The cloth is then to be carried to the fulling-mill, and well scoured, till the water runs from it perfectly colourless. As soon as this operation is performed, a fresh liquor should be prepared with the necessary quantity of dyer's weed, which is only once to be boiled, and when cool, the cloth dipped into it. This last decoction softens the texture, and renders the colour a most beautiful black. Few dyers, however, take so much pains; for they are satisfied with dipping the cloth, when blue, in a decoction of nut-galls, and boiling the whole for two hours. The stuff is then washed, and after adding some copperas and logwood to the liquor, the cloth is again immersed for two hours, at the end of which it is washed, scoured, dried and pressed.

A hot decoction of Aleppo galls, in water, is first to be prepared in a proper vessel, in which cotton or silk stuffs, previously soaked in warm water, must be worked for some time. The superfluous liquid is now to be expressed, and the cloths should be immersed in a black dye, made by steeping alder-bark, and iron hoops, for several months, in a cask of water; or they may be plunged into a solution of iron in vegetable acids. When the stuffs are thoroughly wetted, they must be wrung out, and afterwards soaked in a decoction of logwood, to which a little verdigris is added. The last mentioned process ought to be repeated, till the colouring particles be sufficiently imbibed: during the intervals, it will be proper to rinse the cloths in water, and to dry them in order to fix the colour.

The art of dyeing consists of three operations, viz. Fully to cleanse the substance which is to be dyed, and to remove all foreign matters which might prevent it from taking the colour. 2. To dispose it by particular compositions to receive and retain the colouring principle, and 3. To prepare the bath of colour in which it is to be immersed, and to work it according to the rules of the art.

The article Dyeing is left as Dr. Willich has inserted it, but it conveys little information, and that little is inaccurate. To give all the processes for dyeing different colours and shades of colours, would of itself occupy a large work. The following sketch, communicated by Dr. Cooper, the present editor of this work, to Dr. Mease, its former editor, may be useful.

Substances to be dyed are, silk, woollen, cotton, linen, and skins. Of these, some have more affinity to the colouring matter of vegetables than others, as silk and woollen, more than cotton or linen. But this affinity is in all cases increased by the intermedium of the earth of alum, or the calces of iron and tin: The compositions in which these enter, when applied to the cloth, are termed *mordants*, and they serve as the basis on which the colours stick and are fixed. Thus, if without preparation, a piece of linsey-wolsey be boiled in a decoction of madder or weld, the linen will come out white, the woollen part will be tinged. If part of a piece of cloth be run through a hot solution of alum, it will take a deeper and more permanent dye than the part not so treated.

The *mordants*, then, in common use, are *alum*, iron liquor, which is iron in the acid of vinegar, or in the pyroligneous acid procured from the distillation of wood, and *tin* in the nitro-muriatic acid, or aqua regia. Alum is bought every where ready prepared. Iron liquor is made by putting old iron into beer brewed on purpose, or any other mode of obtaining the acetous acid. It is left to stand in the cask and repeatedly drawn off and poured in again for 6 months. In England it is a trade to make it, though till of late years every dyer made it for himself. The mordant of tin is made thus, to 1 lb. of aqua fortis diluted with one pint of water, add 3 ounces of sal ammoniac; when dissolved, add small pieces of grain tin, till no more be dissolved. Put in but one small piece at a time. The principles of dyeing silk and woollen are much alike. Those who would dye silk, may peruse to advantage Macquer's treatise on this subject, and the art of dyeing wool by Hellot, is also translated into English under the title of the *Art of Dyeing*. The work of Berthollet on dyeing is by far the most scientific yet produced; but none of them are accurate as to the actual processes.

The *mordants* are always kept ready in a dye-house, in a concentrated state, ready to be diluted as occasion may require; the strength of the colour, until it arrives at its maximum, depending on the compound ratio of the strength of the mordant and the quantity of the colouring drug. In the following general recipes, I cannot give the exact proportions, because they vary with everyshade of colour, and with the quality of the drugs: but a little experience in the dye-house, will teach the method of proceeding.

The processes immediately following, are calculated for woollen or silk. It is to be noted, that, in all the colours dyed on woollen, where the mordant is the earth of alum, the dyers use *white* or *red argol*, or the tartar of white or red wine. This is usually supposed to brighten the colour, by means of the acid contained in it, but the real effect is to produce a solution of the earth of alum in the acid of tartar by double decomposition. The proportions used are, 2 parts alum and 1 part tartar, which latter might be increased with advantage.

Scarlet and Crimson. Immerse the woollen for an hour in a hot liquor composed of about ½ a pint of the solution of tin to a gallon of water: then for another hour in a hot (not boiling) solution of cochineal: repeat it till you get your colour: brighten it by running it through the tin liquor of half the above strength. A slight alkaline solution will give it a crimson cast.

Some dye it first with alum liquor made with argol, in the proportion of a quart to the gallon, and then in a bath, or decoction of brazil-wood to the amount of ¼ of a lb. to the one pound of woollen. Then use the alum solution, and then the cochineal, and brighten finally with the tin liquor.

Purple. Add to the mordant of tin, about ¼ of a pint, or less, of a solution of iron in common aqua-fortis, and proceed as above. This gives, according to the proportions of the mordant, all the shades of violet and purple. A false or fugitive purple is also made by means of logwood with the tin liquor, and a small proportion of vitriol of copper.

Red. Alum liquor with argol, as a mordant, then madder in the proportion of ½ lb. of madder and ¼ lb. brazil, or brazilletto, to the piece. Red-wood, and nicaragua wood are bad substitutes for brazil. A false red may also be made by substituting logwood in part for madder.

Chocolate. Add to the alum liquor with argol, about one-half of the acetite of iron and proceed as for red.

Pink. Take bastard saffron or the carthamus tinctoria, usually called safflower. Put it in a bag, wash it well in cold water, treading it, until all the yellow colour is extracted, and the water no longer tinged. Then put it into an alkaline ley made of pearl-ash in the proportion of about ½ lb. to the gallon of water: this will extract the pink colour from the safflower, and give it out to the woollen or silk immersed in it. Old pieces of pink cloth may be immersed in an alkaline lixivium, and the colour extracted will dye afresh.

Yellow. Alum with argol: then for a fast yellow weld, or quercitron bark (quercus tinctoria of Michaud). For a false yellow, fustic.

Orange and Nankeen. Dissolve annatto in caustic alkali, and add of this solution to hot water according to the required tinge: or,

For a faster colour, take iron in the nitrous acid, as much as may be sufficient to produce the required tint, and then run the goods through lime water: or,

Take the alum liquor with argol, then dye with a decoction of mahogany: then run the goods through the tin liquor, and again through the mahogany liquor. The precipitate of platina from AR by sal-ammoniac gives a beautiful nankeen, but too dear to be used.

Blue. The fast colours are made by means of the blue vat with indigo: the false colours by means of the vat of pastel or woad: or by means of vitriolated copper (blue vitriol) and logwood.

The blue vat is made in different ways; by caustic alkali; by urine, or by lime alone, and it may be hot or cold.

A vat with caustic alkali may be made thus: to a pound of indigo well washed, add 1½ lb. of pearl-ash, and 2 lbs. of lime, fresh-slacked with about 2 gallons of water; boil them for two hours, then add them to about 20 gallons of hot water, to which add a quarter of a pound of green vitriol (vitr. iron) and as much red arsenic; stir it frequently: when a green froth has risen, it is ready: or,

Grind a pound of indigo in urine, fresh or stale: add to it about forty gallons of urine: stir it with a rake, till the green scum rises, and the indigo appears dissolved.

The vat, with lime alone, is not so good.

Dip the cloth in this, till the vat be exhausted.

The attempts to dye with Prussian blue have not succeeded in point of expense.

Saxon blue. Take indigo and grind it well, wash it in hot water, till there be no more foulness in the water: to each pound of indigo, add 6 pounds of oil of vitriol, which will not answer the purpose, unless it weighs 29½ ozs. to the wine pint, or be of the specific gravity, 1,85. This should be made in a glass retort, and in a warm place, but not with heat.

Green. First dye a yellow, and then a blue.

Olive. Take equal parts of alum liquor and iron liquor, and then dye with the yellow drugs.

Black. Iron liquor, with a small quantity of verdigris; then a dry liquor of about 1 lb. of the drugs, to 1 lb. of wool: the drugs being a mixture of madder ⅓; and logwood ⅔. The colour is mended, by adding a small quantity of nitrated iron to the mordant, and a small quantity of galls to the drugs: the verdigris with the logwood, gives a blue tinge. Lessen the mordant in strength, and you get all the shades of grey approaching to black.

DYEING OF COTTON.

Drab. Mordant; alum and copperas in equal parts. Drugs; fustic and sumach.

Olive. Mordant, blue vitriol, with copperas, for a greenish olive. Drugs; fustic and logwood: for a brown or reddish olive, add sumach.

Mud Mordant, alum, and copperas. Drug; sumach.

Bloom. Mordant; alum and copperas; or, instead of alum, tin in spirit of salt Drugs; logwood, and sumach.

Purple. Mordant; tin in spir, salt, or aqua regia: drugs; logwood, if not a blue purple, add braziletto.

Chocolate and Brown. Vitriolated iron, and fustic; then vitriolated copper and logwood: or if a bright chocolate is wanted, brazil and the tin mordant.

Buffs and Nankeens. Annatto and fustic: or for a good and tolerable fast nankeen, take equal parts of alum and argol, and dissolve them: this will produce a tartarite of alumine, and sulphite of potash. They should be dissolved in as small a quantity of water as may suffice, in 2 lbs. of alum and 2 lbs. argol to 1½ gallon of hot water; of this solution add a quart to a gallon of hot water; immerse the cotton for an hour; take it out; immerse it in a hot decoction of mahogany shavings, 1 lb. to the 1 lb. of cotton; let it simmer till the dye is exhausted; finish by running it through the tin mordant about half a pint to the gallon of water; then wash off.

[Scott's patent nankeen dye. Boil equal parts of common potash and annatto in water, till the whole is dissolved. Strain it from sediment and bottle it.—T. C.]

Fast Buffs. Tinned iron plates dissolved in aquafortis, then raised in lime.

Yellow. Alum liquor, and a small quantity of verdigris, with weld or fustic.

Green. Blue vitriol (vitriolated copper) with a fustic and logwood.

Crimson and scarlet. Tin in aqua regia. Then Brazil. Braziletto or Nicaragua will not give the required colour.

Pink. See the process with safflower, above given.

Turkey Red. Boil the grey cotton for 3 hours in pearl-ash and fish-oil, about an ounce of each, to each pound of cotton, and water enough to cover it: wash it and dry it. Immerse it during ten days in fish-oil. Squeeze or rinse it well, and hang it up to dry. Run it through a hot solution of alum, in the proportion of alum, one part; water, forty parts by weight. Then run it through a mixture of cow-dung and hot water. Again through the alum liquor. Then through a decoction of galls or sumach; an ounce of galls to the pound of cotton. Then through a dilute solution of glue. Alum it again after washing. Madder it with half a pound of madder to the pound of cotton. Alum it again and madder it again, with from a quarter to half a pound of madder more to the pound of cotton. Brighten it by boiling it for half an hour, in a very weak solution of white soap.

This colour may be imitated, thus:

Boil the grey cotton in pearl-ash and oil, as above. Wash it and dry it. Alum it as above, and then run it through the cow-dung liquor. Wash it. Take the common printers mordant, of alum 1 lb. sugar of lead 1½ lb. water one gallon. Dissolve. Add another gallon of water. Immerse the cotton for a day in this hot solution. Then madder it with ¾ of a pound of madder and one ounce of galls, to the pound of cotton.

The Process of M. HAUSSMAN.

After making a caustic ley, of one part of good common pot-ash, dissolved in four parts of boiling water, and half a part of quick-lime, which I afterwards slaked in it, I dissolved one part of powdered alum in two parts of boiling water; and while this solution of sulphate of alumine was still warm, to avoid re-crystallisation, I speedily poured into it successively, always stirring it without interruption, the above mentioned caustic ley, till the alumine it had at first precipitated after saturation to excess with sulphuric acid, had been re-dissolved. I left at rest this solution of alumine, which exhaled ammonia, and which, on cooling, formed a precipitate of sulphate of pot-ash in very small crystals, I then mixed a thirty-third part of linseed oil, with which the alkaline solution of alumine formed a kind of milky liquid.* As the oil gradually separates itself from this mixture under the appearance of cream, it must not be employed till it is again shaken. The skains of cotton, or linen, ought to be successively immersed in it, and equally pressed, that they may be then exposed to dry on a pole, in the order in which they have been taken from the mixture. They must be dried under shelter from rain in summer, and in a warm place in winter, and be left in that state for 24 hours: they must then be washed in very pure running water, and be again dried; after which, they are to be immersed in an alkaline ley, pressed and dried a second time in the same manner as the first, taking care, however, to recommence the immersion in the ley, with those skains which have been last in the oily mixture, because the first never fail to carry away a larger portion than the last; it will be proper, also, to consume the mixture each time, that it may not have leisure to attract the carbonic acid, with which the lower region of the atmosphere is always charged, especially in manufactories; for the alkali, by passing to the state of carbonate, suffers the alumine to be precipitated, and loses the property of mixing with the oil.

Two immersions in the alkaline solution of alumine, mixed with linseed oil, will be sufficient to obtain a beautiful red; but by continuing to impregnate the skains a third, and even a fourth time, with the same circumstances as the first, colours exceedingly brilliant will be produced.

The intensity of the red, proposed to be obtained, will be in proportion to the quantity of the madder employed. By taking a quantity of madder equal in weight to that of the skains, the result will be a red, which, by clearing, will be changed to a rosy shade; on the other hand, shades of crimson, more or less bright, will be obtained by employing two, three, and even four times the weight of madder, without ever forgetting the addition of chalk, if the water employed does not contain some of it. Four parts of this colouring substance will produce a red too intense and beautiful to be employed in commerce, as it would be too dear to find purchasers.

By making an oily alkaline solution of alumine, with two or three parts of water, and impregnating the skains twice, and even four times, in the manner above mentioned, bright shades will be produced without the use of much madder; but they will not have the same intensity, as those procured with even as little madder by means of the same solution concentrated.

The best method of obtaining shades, lively as well as bright, is to expose the dark reds for a considerable time, when they have been cleared, to the action of a ley of oxiginated muriate of pot-ash, or of soda, with excess of alkaline carbonate, in order to have such a degree of shade as may be required: but it may readily be conceived that this method would be expensive.

To have the oily alkaline solution of alum, nearly in the same state of concentration, it will be necessary to employ an hydrometer, to determine the degree of strength of the caustic ley, before it is employed for the solution of the alumine. This caustic ley must be made with the best common pot-ash that can be procured, and the degree it gives by the hydrometer must be noted, in order that if pot-ash of an inferior quality be afterwards employed, the ley obtained may be carried to the fixed degree of evaporation.

Caustic ley, made with four parts of good common pot-ash,† cannot contain a large quantity of foreign salts. By making it on a large scale, when the limpid part has been decanted, it will be necessary to shake the deposit, for some time, twice every day, that the rest of the alkaline liquor may be decanted; and that none of what still remains in the deposit may be lost, it ought to be diluted with more water, which may be afterwards employed to lixiviate the cotton, which must be well purified and cleaned before it is dyed; which may be done by lixiviating and soaping, or merely boiling it in water and then rinsing and drying it. As wringing with the hands may derange the filaments of the skains of cotton and linen, and consequently weaken the thread, it will be proper, in operating on a large scale, to squeeze them by means of a press.

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* In fact, a saponacious liquor is formed, containing alumine.—A. Tilloch.

† I have no doubt that, where pot-ash cannot be procured, soda might be employed. The Author.

In regard to thread or linen, to be dyed of a beautiful dark and fixed red, it must be well bleached, and impregnated, at least four times successively, with the oily alkaline solution; because not only alumine and metallic oxides adhere with more difficulty to linen than to cotton, but because these mineral substances, when coloured, abandon linen much easier than cotton when cleared. It still remains to examine whether, between each impregnation with the oily alkaline solution of alumine, cotton or linen thread requires to be left at rest for a greater or shorter time, before it is rinsed and dried.

All fat oils may be employed in the mixture, with proper precautions; but linseed oil mixes better, and remains longer suspended in the alkaline solution of alumine: I never tried fish oil, which perhaps would be preferable. It is probable also, that in operating on a large scale, it would be best to diminish the quantity of linseed-oil, in the mixtures with the alkaline solution of alumine; for I have had reason often to observe, that too much oil hurts the attraction of the colouring parts of the madder: a thirty-third part of linseed-oil, always produced the best effect, in my trials on a small scale.

In regard to the process of dyeing cotton and linen thread, sufficiently charged with alumine, by the oily alkaline solution of that earth, the skains must first be disengaged from every saline substance, as well as from the superfluous oil, by rinsing them a long time in very pure running water; after which they must be arranged without drying them, on an apparatus which the operator may construct according to the form of the boiler, in which it is to be placed, in such a manner, that during the process of dyeing, the skains may be continually shaken and turned; in order to catch every where, and in an uniform manner, the colouring particles. The bath must be composed with madder, mixed with a sixth of pounded chalk, and diluted with about 30 or 40 parts of water. The heat must be carried only to such a degree that the hand can be held in the bath for an hour without being scalded; and it is to be maintained, at this degree, for two hours, either by diminishing or increasing the fuel. Three hours dyeing will be sufficient to exhaust the madder: the skains, when taken from the bath, must be washed in a large quantity of water to cleanse them: they are then to be cleared by boiling them a pretty long time, in water containing bran, inclosed in a bag, adding soap and alkaline carbonate, to give the red a rosy or carmine shade.

As I never had occasion to dye cotton or linen thread, on a large scale, I employed a small boiler, which served me at the same time, for the process of clearing; in the latter operation, I confined myself to boiling the skains, properly arranged, in water containing a bag filled with bran, for eight hours successively; and, that I might not interrupt the ebullition, I replaced the evaporated part by the addition of more boiling water. In this clearing, I employed neither soap nor alkali; yet I obtained a red, superior in beauty and fixity to that of the Levant, and which, in every respect, will bear a comparison with the colours dyed in France. For dyeing my red, I employed three parts of the best madder for one part in weight of dry cotton thread.

With the precaution I took to obtain an uniform shade, I could have dyed at one time, but I should always recommend performing this operation at two different times, taking each time, half a portion of madder and of chalk, if the skains cannot be continually turned in the boiler, it may serve also for clearing, by adapting to it a cover, so as to suffer very little of the vapours to escape, because it would be too expensive to replace the part evaporated by more boiling water. By operating on a large scale, and concentrating the heat in the boilers, keeping them almost close, there, perhaps, would be no need of employing eight hours ebullition, to clear and fix the colour. I have every reason to believe, that this clearing of the Turkey red, gave rise to the idea of bleaching with steam: it must have been seen that colours, by being cleared, lose considerably in regard to their intensity; and perhaps it has been observed at the same time, that the packthreads, employed for arranging the skains, were bleached during the clearing, especially when alkalies were added.

A great variety of colours, and of different shades, may be obtained, by following the process here described for obtaining beautiful and durable reds. In this case the oily alkaline solution of alumine, must not be employed till the required shade of oxide of iron, or indigo blue, has been given, but whatever may be the colour, or shade, which you wish to give, before you fix the alumine on the skains of cotton or linen, these skains must always be first well boiled, by which means the adhesion of the indigo fecula, as well as that of the oxide of iron, will be increased in the same manner as that of alumine, coloured by the colouring parts of madder, when subjected to the action of the heat of boiling water before they are impregnated with the oily alkaline solution of alumine. As the method of dyeing indigo-blue, in all its shades, is well known, it is needless to detail it; and as to giving a rusty yellow colour, which may be done at little expense, nothing is necessary but to moisten the skains well with the solution of sulphate of iron, to press them equally, and then to immerse them in a caustic ley of pot-ash, which will precipitate and fix the oxide of iron of a disagreeable colour, but which will not fail to assume a rusty yellow shade, by attracting and becoming saturated with the oxygen of the atmosphere: thus yellow will become more or less dark according to the quantity of the sulphate of iron in solution. More intensity, and even more equality, may be given to the rusty yellow, by moistening the skains a second time in the ferruginous solution, and immersing them in the caustic ley. Care, however, must be taken not to use soda for this operation, because it generally contains sulphur, which blackens oxide of iron by mineralising it.

The skains coloured blue and rustly yellow, treated with oily alkaline solution of alumine, will produce by maddering, dark purple and chamois colours, violet, lilac, puce, mordore, &c. It may be easily conceived, that if, instead of maddering, the same skains prepared for maddering, be dyed with kermes, cochineal, and Brazil-wood, logwood, wood of St. Martha, woad, yellow-wood, quercitron, yellow berries, &c. a great variety of colours will be obtained: the shades may even be varied *ad infinitum*, by mixing the colouring ingredients with each other in different proportions. The affinity of adhesion of the colouring parts of all these ingredients, varies also, to such a degree, that the shades arising from a yellow or olive green, will be changed, or totally metamorphosed, by a second dyeing with madder, kermes, cochineal, or Brazil wood; and will furnish orange shades, capucine, carmelite, burnt bread, bronze, &c. As the preliminary preparation of the skains by the oily alkaline solution of alumine, might be too expensive for some of these colours, the process I described in the *Annales de Chimie*, for the year 1792, p. 250, may be substituted in its stead. The process consists in treating the skains, alternately, with soap and sulphate of alumine, the excess of the acid of which has been saturated with one of the alkaline carbonates, or with lime: this method is very expeditious. In the course of a day, especially in summer, the skains may be prepared and dyed red as well as other colours; which, for the most part, may be subjected to ebullition, and will bear clearing with bran for a quarter or half an hour, and even some of them for a whole hour. It is also to be observed, that there are none but madder colours, the alumine and oxide of iron, bases of which have been fixed on the stuffs, by means of the oily alkaline solution, that can acquire perfect fixity by the action of heat of boiling water; and that the fixity is very inferior in all madder colours, the earthy and ferruginous bases of which, have been applied to stuffs by means of acid solvents.

Alumine fixed in abundance on cotton or linen stuffs, by means of a highly concentrated alkaline solution attracts very easily the colouring parts in the process of maddering. The case is not the same when the same earth is applied, by the most highly concentrated acetic solution of alumine; and it is absolutely impossible to finish maddering at one time, even when a profusion of madder is employed, and the operation is repeated three and even four times.* This circumstance will give rise to new and interesting experiments; but my observations prove in the mean time, that maddering, in general, requires to be managed with the nicest attention.

DYERS'-GREEN-WEED, or WOOD-WAXEN, BROOM, *Genista tinctoria*, L. is an indigenous plant, growing in pastures, and on the borders of corn-fields. It produces yellow flowers, which blow in the month of July or August, and are succeeded by numerous seeds.

This herb is eaten by horses, cows, sheep, and goats: the flowers afford a yellow colour, which is preferred to every other, for dyeing wood green. This plant also yields the fine yellow lacker of painters, by boiling the stalks and leaves in lime-water, and again placing the clarified decoction over the fire, with chalk and alum.

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* Concentrated acetic solution of oxide of iron, is attended with nearly the same difficulties.

A drachm and a half of the seeds, when pulverised, operates as a mild purgative. A decoction of the whole plant is said to be diuretic, and has been given with success in cases of dropsy.

DYERS'-WEED, or **YELLOW-WEED**, *Reseda luteola*, WELD, L. an indigenous annual plant growing in meadows, pastures, on walls, and barren uncultivated spots, particularly on the rubbish thrown out of coal-pits. It has a cylindrical, hollow, furrowed stem, and produces yellow flowers which blow in the month of June or July. This plant is not relished by cattle, few eating it except sheep, which sometimes browse it a little.

The dyers'-weed imparts a most beautiful yellow colour to wool, cotton, mohair, silk, and linen, and is principally used by dyers for that purpose, as it affords the fastest and brightest dye. A decoction of this plant also communicates a green colour to blue cloths and constitutes the basis of *Dutch pink*. The tinging properties reside in the stems and roots, which should be cultivated in sandy situations; because rich soils render the stalks hollow, which consequently do not impart so delicate a colouring matter. M. GADD informs us, in the 29th vol. of the *Transactions of the Swedish Academy*, that he found the following proportion of ingredients to be the most practically successful in making the preparatory lixivium : viz. for one pound of wool, two ounces of alum, six drachms of cream of tartar, to be dissolved in three gallons of water, to which are to be added two handfuls of wheaten bran. After remaining 12 hours in this decoction, the wool is to be taken out, rinsed, then half-dried, and afterwards boiled, together with half an ounce of potash, and one pound of dyers'-green-weed, in four gallons of water; the wool must be gently agitated, till it acquire the proper shade of yellow. If silk or linen are to be dyed, both the tartar and bran must be omitted, and the colouring matter fixed with alum and pot-ash, one ounce of pot-ash to one pound of alum: but, in woollen cloth or yarn, the permanency of the colour is remarkably promoted by the addition of wheaten bran.

A water colour is made from weld, and used by paper-hanging manufacturers, for elegant work.

It is the small seeds of the plant only, which afford the colouring matter. The following process for preparing this elegant yellow colour, is extracted from TILLOCH's *Phil. Mag.* vol. 13. When made, it will fall into a fine powder, and require no grinding. There is not to be found either in the vegetable or mineral kingdoms, any other substance which yields so elegant a yellow colour as the weld.

Take of pure carbonate of lime, (fine washed whiting) any given quantity: say four pounds: put it into a copper boiler, and add to it four pounds of soft water: put a fire under the copper and raise it to a boiling heat, and keep stirring with a deal stick till the whiting be completely divided and form with the water a consistence quite smooth. Then add for each pound of whiting three ounces of alum previously pulverised tolerably fine. The alum must be added gradually, and the operator should keep stirring with his deal stick during the administration; for a double decomposition is effected, accompanied with effervescence, and carbonic acid is discharged. Thus, if the alum were not administered gradually the boiler would overflow from the violence of the effervescence, and if the whiting were not well divided previously to the introduction of the alum, the distribution among the whiting would be unequal, and the colour injured. When the effervescence ceases, the basis is properly prepared. The fire may then be drawn, and it may remain for any length of time without injuring, till the other materials are ready. Place the weld with the roots uppermost, in another copper boiler, pour in soft water enough to cover every part containing seed, and boil them not more than fifteen minutes; then take them out, place them, with their roots uppermost, in a tub to catch the liquor which runs from them, and pass the liquor in the copper with what runs from the weld in the tub, through a flannel filter, to intercept the seeds and fecula; and thus the colouring matter is prepared.

It is impossible to say what quantity of welds should be employed to any given quantity of whiting; for some bundles will contain three times as much seed as others. It is well, however to know, that if too much colouring matter be prepared, it may be kept in an earthen or deal vessel for many weeks, without sustaining any injury.

Having filtered a sufficient quantity of the weld, put a fire under the boiler containing the basis, and add the weld liquor till the colour be attained. When sufficient colouring matter is added to the basis the fire should be raised to a boiling heat, and the work is finished. In order to be satisfied with the greatest strength of colour is attained, take a little out on chalk, which will absorb the moisture instantly, when it may be laid on paper with a brush, and received perfectly dry in a few minutes.

The contents of the furnace should then be put into a deal or earthen vessel to precipitate. The next day the liquor may be poured off, and the colour may be placed on large pieces of chalk, which in a few hours will absorb the moisture, and it will then be fit for use.

The liquor poured off from the colour, may, with the addition of water be used again, and the old welds may be boiled a second time, and taken out previously to the addition of fresh welds, so that no colouring matter will be lost.

DYKE: breaks in mines by means of which the strata through which the dyke passes, are dislocated, and thrown out of their level on each side of the dyke. Dykes are volcanic matter generally injected from below, and usually consist either of basalt or whin, or of toad-stone. They sometimes extend 60 or 80 miles.

Dyke, or Dike, a sort of dam constructed of earth, timber, fascines, &c. to oppose the entrance of water from rivers, and from the sea.

Dykes made to exclude the sea from marshes, are built with sods cut out of the marsh, so as to make a ditch near the dyke, or else a ditch on each side. The sods are laid as a wall sloping on both sides: they should be laid very close, that the water may not enter; and some slender bushes should be laid between them, that the work may hold together the better. Some of the bushes should have roots to them, that they may grow, and more strongly bind the sods together. Shrubs without roots will not live placed in the dykes at midsummer, the time when dykes should be built.

A dyke seven or eight feet wide at bottom, and three at top, and made a little higher than the highest spring tides rise, will be sufficient on high marshes. When a dyke passes through a low place, or through a creek, it must be wider at bottom in proportion to the depth of the hollow, or creek, so that the sides of the dyke may be perfect inclined planes. Though this will make it very thick at bottom, it is necessary, that it may resist the greater pressure of water against that part.

When we build on an oozy soft spot it is best to fill the mud with piles, driven as deep as they will easily go, and then cut off, even with the surface. This will give stability to the foundation, and prevent the water's undermining the dyke. On a sideling place, stakes should be driven through the dyke into the marsh, to hold the sods in their place.

In the creek, or creeks, there must be sluices, larger or smaller in proportion to the quantity of fresh water that will need to pass out.

DYSENTERY, or **Bloody-Flux**, an infectious disease, attended with a discharge of blood and purulent matter by stool; violent gripings; a continual inclination to go to stool; pains in the loins; fever, &c.

Unwholesome night-air, damp places, and a suppression of insensible perspiration, may be considered as the principal causes of this disease; which is also, though rarely, occasioned by the immoderate eating of *unripe*, acrid fruit. The treatment of this disorder depends on two circumstances: 1. Whether it be accompanied with fever; and, 2. Whether the patient be of a plethoric habit, or the contrary. In both the former cases, we advise the reader not to attempt the cure of a disease which has often baffled the talent of the most learned and experienced, but immediately avail himself of medical advice, especially as the malady is contagious.

If, however, the dysentery be unattended with febrile symptoms, he may take, at the commencement of the disease, a brisk emetic of a scruple or half a drachm of the ipecacuanha-root in powder, then a dose of magnesia and rhubarb, and afterwards two grains of ipecacuanha every four or six hours: such medicine having, by experience, been found singularly efficacious. [Advantage will generally be derived from the application of clysters, and if the disorder continues, inject after the clyster every evening about 25 or 35 drops of laudanum, which procures rest and takes away the irritation. T.C.]

When the dysentery prevails as an epidemic, it is observed to be highly contagious. If flight cannot be conveniently effected, frequent purges of castor oil, or rhubarb, with magnesia, must be taken to prevent the disease. These have been found in some instances highly beneficial. [The regimen should consist of mucilaginous drinks, such as barley-water, flaxseed-tea, &c. but no animal food in the early stage. —T. C.]

E.

E, the fifth letter in the alphabet, and the second vowel, has different pronunciations in most languages. The Greeks have their η and ε, or long and short *e*. The French have their *e* open, *e* masculine, and *e* feminine or mute. In English there are three kinds of *e*, open or long, as in *wear*, *bear*; short, as in *wet*, *kept*, and mute as in *love*, *came*, &c. As a numeral, E stands for 250. In Sea-charts E stands for East: E by N. and E by S. East by North, and East by South.

EAGLE, the Golden, or *Falco chrysaetes*, L. a bird of prey, which weighs about twelve pounds, and is nearly three feet long; but, with its expanded wings, measures above seven feet.

These birds possess the senses of sight and smell in an uncommonly acute degree: they are also remarkable for their longevity, and their long abstinence from food. There are instances of eagles having attained an age exceeding one hundred years, and of one which existed twenty-one days without sustenance.

Eagles are very destructive to lambs, kids, fawns, and all kinds of game, especially during the breeding season, when they carry vast quantities of prey to their young.

We have four species of eagle in the United States, viz. 1. Grey eagle, which is the largest: 2. Bald eagle, (*Falco leucocephalus*): 3 Fishing eagle: 4. Black eagle. Besides these, we have many species of Falco, or Hawks.

EAR, the organ of hearing, or that part through which animals receive the impression of sounds.

This organ is extremely tender, and subject to a variety of disorders. If it be suffered to continue for any length of time without being cleaned, a species of wax accumulates in it; which, if not speedily removed, becomes tough and hard, diminishes the acuteness of hearing, and produces at length total deafness. An abundance of ear-wax, if thin and acrid, occasions pain, and is sometimes accompanied with a running in the ears: hence these parts should be strengthened by washing them every day with cold water; by which the sense of hearing will be considerably improved and preserved.

To this may be added the distressing complaint, denominated the *ear-ach*, which usually proceeds from an inflammation, though it is sometimes occasioned by a sharp serous humour, stimulating the membrane that lines the canal of the ear: this painful affection also sometimes originates from insects that have penetrated the cavity of the ear; in which case, some sweet oil should be introduced into the orifice, and the person ought to lie on that side of the body, the ear of which is the seat of complaint. By such means, the worm or insect may be extracted, and the pain consequently removed.

The ear-ach may be also occasioned by exposure to a current of air, from wet feet, and likewise from blows, or similar accidents.

For persons peculiarly liable to take cold, the best preventive will be, to keep both the head and feet warm and dry. In ordinary cases, the patient will be relieved, by holding the painful side over the steam of warm water, and afterwards putting into the ear a piece of cotton, which has been previously moistened with a few drops of laudanum.

Should the pain be extremely acute, and accompanied with throbbing, and other inflammatory symptoms, it will be advisable to resort to blood-letting, and to apply blisters behind the ear, or to the neck. If an abscess be apprehended, warm poultices should be frequently laid on the part affected, before they become cold; and when such abscess breaks, milk and water, or chamomile tea, with the tincture of myrrh, must be repeatedly injected by means of a syringe. [Call in a surgeon.—T C.]

EARTH, in astronomy and geography, one of the primary planets, being this terraqueous globe whereon we inhabit.

The *figure of the Earth* was accounted by some of the ancients to be like that of an oblong cylinder; by others, of the form of a drum, and by others flat. The moderns demonstrate it to be nearly spherical from the following, among other considerations. 1. All the appearances of the heavens, both at land and at sea, are the same as they would be if the earth were a globe. 2. In eclipses of the moon, which are caused by the shadow of the earth falling upon the moon, this shadow is always circular; and a body can be no other than a globe, which in all situations casts a circular shadow. 3. Several navigators have sailed quite round the globe, steering their course directly south and west till they came to the Magellanic sea, and thence to the north and west, till they returned to their port from the east; and all the phenomena which should naturally arise from the earth's rotundity, happened to them. Besides, their method of sailing was also founded upon this hypothesis, which could never have succeeded so happily, if the earth had been of any other figure. It is true, the surface of the earth is not an exact geometrical globe; but the inequalities are so inconsiderable, that the highest mountain bears no greater proportion to the bulk of the earth, than a grain of dust does to a common globe. The figure of the earth, then, was reckoned by mathematicians and geographers as perfectly spherical, excepting the small inequalities on its surface, of mountains and vallies; till an accident engaged the attention of Sir ISAAC NEWTON, and M. HUYGENS, who demonstrated from the laws of hydrostratics, and the revolution of the earth about its axis, that its figure was not a true sphere, but an oblate spheroid flatted towards the poles. Not only the figure of the earth has been ascertained, but its magnitude, and it is found that its diameter is equal to 7,958 miles in length. Circumference 25,000. Superficies 198,944,206 square miles. Solidity 26.393,000,000 cubic miles. It is also imagined that the unexplored portions of the earth and seas contain 160,522,026 square miles. The inhabited part of the earth is equal to 38.422,180, in the following proportions.

Europe	- - -	4,456,065
Asia	- - - -	10,968,423
Africa	- - -	9.654,817
America	- - -	14,142,875

MOTION OF THE EARTH. The earth has a triple motion. 1. A diurnal motion round its own axis, from west to east, in twenty-four hours, which occasions the perpetual succession of days and nights. 2. An annual motion round the sun in a year, which produces the different seasons, and the lengthening and shortening of days. 3. That motion by which the poles of the world revolve about the poles of the ecliptic, and occasion what is commonly called the precession of the equinoxes, or more properly, the retrogression of the earth's nodes.

EARTH, *in Chemistry, and Mineralogy* It has usually been considered that the solid contents of the globe are formed from a single elementary substance, called earth. This, however, is a very erroneous notion, since they are composed of several elementary substances, amongst which there have been enumerated no fewer than nine different kinds of earth:

1. Silex.
2. Alumine.
3. Zircon.
4. Glucine.
5. Yttria.
6. Barytes.
7. Strontian.
8. Lime.
9. Magnesia.

These, when freed from foreign admixture, are, for the most part, of white colour, not soluble in water, not combustible, and do not exceed four times the weight of water.

The whole of these earths have, till lately, been considered simple and uncombined substances; but, by the discoveries of Sir HUMPHREY DAVY, it has been ascertained that four of them have a metallic basis, and are in fact metallic oxides, or compounds consisting of a metal united with oxygen. These, which have the same affinity with their respective bases as rust has to iron, are silex, lime, barytes and alumine. Until, however, some further light be thrown upon their nature and constitution, they must continue to hold their former situation of simple earths.

Silex, or *Siliceous Earth*, is the basis of all substances known by the name of quartz and silex. It has never been found pure in a state of nature; but, in combination with other substances, it abounds in almost every country of the globe. Common flint contains ninety-seven parts out of a hundred of silex; it consequently has given its name to this earth, silex being the Latin word for flint. When purified it is a white powder, the particles of which are harsh to the touch, as if they consisted of very minute grains of sand. It is not quite three times as heavy as water, and has neither taste nor smell. Water will not dissolve it, nor any kind of acid, except fluoric. Sir H. DAVY has discovered it to to have a metallic basis, to which he has given the name of *silicium*.

Silex has various uses in the arts, and is one of the most valuable substances we are acquainted with. In various states of combination it is employed in the making of roads, as an ingredient in glass, for making chemical furnaces and utensils, in the manufacture of pastes, or artificial gems, and for innumerable other useful purposes.

Alumine is a kind of earth so called from its forming the basis of alum. It is very soft, compact, and tenacious; about twice the weight of water, and, when breathed upon, has a smell which is peculiar to all clayey productions. In the fire it shrinks, and becomes so hard as even to strike fire with steel. It readily absorbs water, and is dissolved by most acids. Some writers state that pure alumine has been discovered in a native state near Halle, in Germany. It is found in a chrystallised form, and nearly in a state of purity, in the Oriental ruby and sapphire. The name of *argil*, or clay, has sometimes been applied to it, but in mineralogy this name has usually been given to a mixture of alum, quartz, and other substances. Sir H. DAVY has obtained from alumine a metallic basis, called *aluminum*.

From the different combinations of alumine are made all kinds of earthenware. To the dyer and the calico-printer it is an article of indispensible necessity: and fullers and scourers of cloth employ it with great advantage in their respective operations.

Zircon, when freed from those substances with which it is combined, is a white and somewhat rough powder, insipid to the taste, insoluble in water, and about four times as heavy as that fluid. It is found in the two kinds of precious stone called jargoon and hyacinth, and has not hitherto been applied to any useful purpose.

Glucine is a kind of earth of peculiar nature which is found in the emerald and beryl, and when purified forms a soft, light, and white powder, without smell, and of a sweetish taste. To the last of these qualities it is indebted for its name, which is derived from a Greek word signifying sweet. It is somewhat unctuous to the touch, and about three times as heavy as water. The uses of this earth, whatever they may be, are not known.

Yttria is an earth which, amongst other particulars, differs from glucine by its weight, since it is nearly five times heavier than water. In a natural state it occurs as the basis of a black Swedish mineral, called gadolinite. When cleansed by chemical process from all its impurities it is a fine, white, and inodorous powder.

Barytes is a white, porous, and very heavy earth, which can only be obtained pure by chemical process. It is easily reduced to powder, and is soluble in all kinds of acids. To the taste it is very harsh and caustic, and if taken into the stomach proves an extremely virulent poison. In some respects it agrees with the alkalies, particularly in its property of changing blue vegetable colours to green, and in corroding like them, though with less energy, all kinds of animal substances. From these circumstances it has sometimes been denominated an alkaline earth. Saturated with sulphuric and carbonic acid, it constitutes the minerals denominated sulphate and carbonate of barytes. It has been discovered to have a metallic base, which is called *barium*.

Strontian is an earth which, like barytes, is not found otherwise than in combination with sulphuric and carbonic acids. It occurs in great abundance in different parts of the world, and, when purified, forms a porous mass of greyish white colour, acrid taste, and somewhat alkaline nature. This earth converts vegetable blue colours to green, but does not act so strongly on animal bodies as barytes, nor is it poisonous like that substance.

Lime, the basis of all those substances which are denominated *calcareous*, is only to be obtained in a state of purity by artificial process. Combined with carbonic acid it forms limestone, chalk, and marble; but, correctly speaking, none of these substances are lime, though they are all capable of being converted into such by burning. Lime may also be obtained from oyster and other sea shells. When pure, it is of a white colour, and moderately hard substance, though easily reducible to powder. Its taste is burning and acrid; and, like the alkalies, it changes vegetable blue colours to green. It has likewise the property of corroding and destroying animal substances. Lime, when pure, absorbs water with great avidity, becomes hot, and falls into powder. Even merely exposed to the open air it gradually attracts moisture, and assumes a powdery form; soon after which it becomes saturated with carbonic acid from the atmosphere, and is thereby again converted into carbonate of lime. It occurs abundantly in almost every country, but always in combination with some acid, carbonic, sulphuric, boracic, fluoric, or phosphate. This substance has a metallic basis, which has been denominated *calcium*.

Magnesia is a light and perfectly white kind of earth, of soft powdery appearance, without taste or smell and somewhat more than twice as heavy as water. It is not found in this pure state in nature, but may be prepared from Epsom salt, which consists of magnesia in union with sulphuric acid. The slightly acrid taste observable in the magnesia used in medicine arises from a portion of lime which it contains. This substance does not dissolve in water, but is soluble in every kind of acid. It has the property of changing delicate blue colours to green.

Every body that has the following properties, is an earth:

1. Insolubility in water; at least when combined with carbonic acid. 2. Little or no taste or smell; at least when combined with carbonic acid. 3. Incombustibility; and incapability, while pure, of being altered by fire. 4. A specific gravity not exceeding 4.9. 5. Capability of assuming, when pure, the form of a white powder.

EARTH-NUT, a native plant of two species, namely, the *Bunium bulbocastanum*, or Great Earth-nut; and the *flexuosum*, or Common Earth-nut, or Pig-nut. Both are perennial plants, growing in sandy or gravelly meadows, pastures, orchards, and woods: they flower in the month of May or June.

The roots of these plants are at present searched for only by hogs, which devour them with avidity; but as they are very little inferior to chesnuts, we think they might form an agreeable addition to our winter desserts, and be eaten either raw, boiled, or roasted.

The earth-nut, or ground-nut, of the southern United States, is the *Arachis hypogæa*, L. They are also called *pinda* by the negroes, by whom they are chiefly cultivated. They are a sort of dwarf-pea: after the blossom falls off, the young fruit turns down, and enters the earth, which is carefully heaped about the plant. When ripe, a cylindrical shaped husk, contains generally two beans, which, when slightly toasted in a hot oven in the husks, are pleasant eating, being sweet and oily. A preparation of these kernels, combined principally with the dry bark of sassafras pulverised, is an excellent substitute for chocolate. In Cochin-China, the oil of the arachis is used for lamps, and as a substitute for olive oil. It thrives best in a sandy soil.

EARTHQUAKE, is a sudden and violent concussion of the earth, which is generally attended with uncommon noise, both in the air, and under ground; in consequence of which, whole cities are at once levelled, as well as rocks; the course of rivers is altered; and the most dreadful devastations are thus occasioned.

Of the observations, which indefatigable naturalists have been able to collect, the following are the principal: 1. Where there are any volcanoes or burning mountains, earthquakes may naturally be expected to occur more frequently, than in other countries. 2. Earthquakes are, in general, preceded by long droughts; but they do not always happen immediately after them. 3. They are, likewise, frequently indicated by certain electrical appearances in the atmosphere, namely, the *aurora borealis*, the falling of stars, &c. 4. A short time previous to the shock, the sea swells with a loud noise; fountains are disturbed, and become muddy; and the irrational animals appear frightened, as if conscious of approaching calamity. 5. The air, at the time of the shock, is in general, very calm and serene; but afterwards becomes dark and cloudy. 6. The concussion begins with a rumbling noise, similar to that of carriages: a rushing sound resembling the wind is sometimes heard; at others, explosions not unlike the firing of cannon; and the ground is agitated in different directions. A single shock seldom exceeds a minute in its duration; but frequent concussions succeed each other, at short intervals, for a considerable length of time. 7. During the shock, chasms are made in the earth, whence flames, but oftener vast quantities of water, are discharged. Flames and smoke are also emitted from spots of ground where no chasms are perceptible; and though the abysses formed in the earth are in general not extensive, yet in violent earthquakes they are frequently so large as to bury whole cities. 8. The water of the ocean is, on such occasions, affected perhaps still more than the land; the sea now rising to a prodigious height, now divided to a considerable depth, and emitting great quantities of air, flames, and smoke. Similar agitations occur in the waters of ponds, lakes, and even rivers.

Earthquakes are sometimes confined to a narrow space, which is properly the effect of the reaction of the fire; and they shake the earth just as the explosion of a powder-magazine causes a sensible concussion at the distance of several leagues. Sometimes they are felt at considerable distances, and shake a long tract of ground without any interruption or volcano appearing. There are instances of earthquakes which were felt at the same time in England, France, Germany, and Hungary, and these always extend a great deal more in length than in breadth: the earthquake, on the 1st of Nov. 1755, which destroyed Lisbon, extended from north to south 2500 miles with the utmost violence; it appears to have begun in Greenland, and passing southward was felt in the islands of Trinity, Ferro, some of the western isles of Scotland, in Ireland, in the south-west part of England, &c. and passing under the ocean shook all Portugal and great part of Spain, whence it passed to the continent of Africa with incredible violence, and having terrified the kingdoms of Fez and Morocco, probably vented itself in the southern ocean. Earthquakes shake a tract of ground with more or less violence in different places, in proportion as it is remote from the fire; and they are almost always accompanied with a dull noise like that of a heavy carriage rolling along with great rapidity.

The cause of earthquakes, or the theory of this tremendous phenomenon, is but imperfectly understood. [They may arise, 1. From the confinement of air within the bowels of the earth, where it is generated by chemical processes. 2. From steam. 3 From electricity. We know not yet *their* causes. —T. C.]

EARTH-WORM, or *Lumbricus*, L. a well known insect, which is destitute of feet; it is of an oblong form; round shape, and covered with a soft, slender skin, marked with annular ridges and furrows. It is common in all parts of this country, at little depths beneath the surface of the earth; a worm like it is not unfrequently found in the human intestines, as well as in those of the lower animals.

Earth worms were formerly reputed to be of great virtue in medicine; but are at present more usefully employed in feeding poultry and other birds.

EAR-WIG, or *Forficula auricularis*, L. a well known insect, which has received its name from penetrating into the human ear, where it causes the most acute pains, and even, as some have asserted, eventual death.

Various remedies have been applied to extract this noxious insect, such as the holding of a slice of apple to the ear; pouring of Madeira wine or brandy into that organ, &c. But the safest, and we conceive, the best remedy is, to pour olive oil into the part affected, and to avoid on every occasion sleeping on the ground, particularly during the autumnal months.

Ear-wigs are likewise extremely destructive in gardens, especially where carnations, nuts, or filberts, pears and apples are reared. They are so peculiarly fond of the flowers first mentioned, that if they be not timely prevented, they will entirely destroy them, by consuming the sweet part at the bottom of the petals or leaves. To prevent these depredations, the usual practice is, to put the bowl of a tobacco-pipe, or the claws of lobsters, upon the sticks supporting the flowers, because earwigs creep into cavities and dark places during the day. The placing of hollow reeds behind the twigs of wall-trees, has been found of considerable service, if they be examined and cleared every morning. A visit at midnight, however, is preferable, as more vermin may then be destroyed in one hour, than can be exterminated in one week by the other means; and the garden will in a short time be, in a very considerable degree, if not totally, freed from their depredations.

The following method of extirpating these mischievous insects, is recommended by Mr. FORSYTH, who has successfully practised it for several years. Let old bean-stalks be cut into tubes, about nine inches long; then be tied up in small bundles, either with packthread, or the pliant twigs of young willows; and be suspended on nails, against the wall, in the vicinity of trees. Early in the following morning, a board about 18 inches square should be procured, and a small wooden trowel: the bundles of such bean-stalks are now to be taken down separately, stricken against the board, and the ear-wigs be destroyed with the trowel, as they fall out of the stalks. If this method be repeated daily, or every second morning, the increase of the insects will speedily be checked.

The propagation of these vermin may be still more certainly prevented, by immersing the shreds taken from trees that have been unnailed in autumn, in boiled soap-suds, for three or four days previously to using them again: in this simple manner, the eggs of ear-wigs, as well as those of other insects, will be effectually exterminated.

EAST-INDIA COMPANY, a company of merchants trading to the East Indies, and Canton, Amoy, and Chusan, ports of China, incorporated about the 42d of queen ELIZABETH, A. D. 1600, and empowered to trade to countries to the eastward of the Cape of Good Hope, exclusive of all others. About the year 1698, application being made to parliament by private merchants, for laying this trade open, an act passed empowering every subject of England, upon raising a sum of money, for the supply of the government, to trade to those parts. A great subscription was accordingly raised, and the subscribers were styled the New East-India Company; but the old establishment being in possession of all the forts on the coast of India, the new one found it its interest to unite; and both, trading with one joint stock, have ever since been known under one name, viz. *The United East India Company.*

In the age of NERO, the East India trade was carried on by the river Nile; the merchandise proceeded in caravans to the Red Sea, where it was embarked for the Indian Ocean. The specie annually carried from Rome, upon this account, amounted, according to PLINY's computation, to about 300,000*l.* sterling; and the usual returns, which arrived in December and January, yielded, in clear gain, an hundred for one.

EAU-DE-LUCE, a liquid volatile soap, of a strong pungent smell, which is prepared in the following manner: 10 or 12 grs of white soap are dissolved in 4 oz. of rectified spirit of wine; after which the solution is strained. A drachm of rectified oil of amber is then added, and the whole filtrated; with this solution should be mixed such a proportion of the strongest volatile spirit of sal-ammoniac, in a crystal glass bottle, as will, when sufficiently shaken, produce a beautiful milk-white liquor. If a kind of cream should settle on the surface, it will be requisite to add a small quantity of the spirituous solution of soap. Those who may wish to have this liquor perfumed, may employ lavender, or Hungary water, instead of the spirit of wine.

Its use, as an external remedy, is extensive; for it has been employed for curing the bites of vipers, wasps, bees, gnats, ants, and other insects, for burns, and even the bite of a mad-dog, though not always with uniform success.

EBONY, an exceedingly hard and heavy wood, imported from the East-Indies; it admits of being very highly polished, for which reason it is used chiefly for veneering cabinets, in Mosaic work, &c.

Ebony is of various colours, viz. black, red, and green; but the first is that most generally known, and used. Cabinet-makers, inlayers, and others, frequently substitute pear-tree, and other wood, for ebony, by giving the former a black colour; which some effect by washing it in a hot decoction of gall-nuts, and after it is dry, by rubbing it over with ink, and polishing it by means of a hard brush and a little wax: others heat, or almost burn their wood, till it become black, so that it acquires such a degree of hardness, that, when properly polished, it can with difficulty be distinguished from genuine ebony.

The ripe *fruit* of the ebony tree is eaten by the natives of Ceylon: but it is astringent, and not very palatable.

LINNÆUS was of opinion that ebony was the wood of a shrub (*ebenus cretica*) which grows in the island of Crete, and has silky leaves and rose coloured flowers.

ECHALOTTE. See GARLIC.

ECLECTICS, ancient philosophers, who, without attaching themselves to any particular sect, selected whatever appeared to them the best and most rational from each.

ECLIPSE, in astronomy, the deprivation of the light of the sun, or of some heavenly body, by the interposition of another heavenly body between our sight and it. A total eclipse of the sun or moon is when their whole bodies are obscured; and a partial one is when part only of their bodies is darkened: a central eclipse is when it is not only total, but the eclipsed body passes through the centre of the shadow. In explanation of eclipses, the mind must figure to itself the body of the sun, irradiating the earth on one side of its globe, which being a solid body, intercepts the rays, and therefore projects a long shadow from its opposite side: now, when the moon happens to come in a line with this shadow, it falls upon her, and she is eclipsed. If she is in a direct line with the earth, she is wholly overshadowed, that is, suffers a total eclipse: but if she be in some degree without this direct line, on either side, then there only ensues a partial eclipse, her whole orb not being, in this case, at any period of the eclipse, obscured.

An eclipse of the sun happens when the moon passes between the earth and that body, and thus intercepts his rays. In this case, an inhabitant of the moon would observe a partial eclipse of the earth.

An eclipse of the sun never happens but at a new moon: nor one of the moon but when she is at her full.

ECLIPTIC, in astronomy, a great circle of the sphere, supposed to be drawn through the middle of the zodiac; or, more strictly speaking, that path or way among the fixed stars, that the earth appears to describe, to an eye placed in the sun. It is called ecliptic, by reason that all eclipses happen when the planets are in or near its nodes.

Ecliptic, in geography, a great circle on the terrestrial globe, not only answering to, but falling within the plane of the celestial ecliptic.

ECONOMY, a term of extensive signification, and if its meaning be properly understood and practised, the result cannot fail to be attended with the happiest effects. It is, in particular, applied to *rural, domestic, animal,* and *political.*

Political Economy is the science which treats of the wealth of nations. Its object is first to ascertain in what wealth consists, and then to explain the causes of its production, and the principles on which it is distributed.

EDDOES, a variety of the Arum Esculentum, L. Another variety is the Tanniers. Both these resemble each other, except that eddoes are smaller, more acrid, and require longer boiling than tanniers. They are planted in South Carolina, in the latter end of March, in small beds, or hills, three or four feet apart; the leaves are very large, from eighteen inches to two feet long, and from twelve to fifteen inches wide. For seed-plants, the small fruit of the last year, or the larger fruit, cut in two, is planted. During the growth, the earth is drawn up once or twice around the root, and the grass hoed from them; they are dug in before the heavy frosts commence, and put away in cellars, covered with earth and straw, or pine leaves. They are excellent, when boiled and eaten with butter, like yams. A rich mellow soil, inclining to moist, such as is generallly found along declivities of land, just before it becomes wet and boggy, answers best for eddoes and tanniers.

EDUCATION is the art of rearing, forming, and instructing children, according to the most appropriate rules and maxims. Many volumes have, from time to time, been published on this most important subject; and though almost every writer aims at giving to the public a system peculiar to himself, yet all agree that the grand object of education is the *gradual improvement of our moral, physical, and intellectual faculties.* It would lead us too far from our limits to lay down only the general principles by which a good and rational education ought to be regulated.

[Two of the best books on the subject, are "Edgeworth's *Practical Treatise on Education,*" and Dr. Darwin's little book on the education of daughters. —T. C.]

EEL, or *Muræna*, L. a genus of fish comprising seven species, the three most important of which we shall describe.

The Roman Eel, *Muræna helena*, is a long and slimy fish, of serpentine form, variously marked and spotted, and destitute of pectoral fins.

It is an inhabitant both of fresh and salt waters, and is chiefly found in the Mediterranean sea, and the rivers that run into it.

By the Romans this fish was regarded one of the greatest delicacies which could be introduced at their tables; and instances have been recorded of wealthy persons having even fed them with the flesh of slaves that had been condemned to die, believing that they were thereby rendered still more excellent. In many parts of the coast of Italy, reservoirs were made in the sea for storing and fattening these fish in; and the luxurious Sybarites exempted from every kind of tribute the persons who sold them. Representations of them were made into ear-rings, and into other ornaments for female attire. Pliny tells us that one of the Roman punishments for youths under the age of seventeen years was to flog them with whips made of eel-skin.

The Common Eel, *Muræna anguilla*, is distinguishable by its lower jaw being somewhat longer than the upper, and the body being of an uniform colour.

It is an inhabitant of rivers and ponds in almost every country of Europe; and sometimes grows to the weight of fifteen or twenty pounds.

The flesh of the eel affords a very rich and delicious food; and were it not for groundless prejudices, arising from its serpent-like shape, this fish would be in much greater request for the table than it now is.

So abundant are eels in many of the rivers adjacent to the sea, that in the first autumnal floods several tons weight have sometimes been caught in a day; and in the river Ban, near Coleraine in Ireland, there is an eel-fishery of such extent as to be let for 1,000*l.* per annum. The modes of taking eels are various, but these are chiefly by traps or engines of different kinds, so contrived as to admit of their entering, but to prevent their return.

In the river Ryne, Northamptonshire, a small kind of eels are caught with small heads and narrow mouths which have the name of *bed-eels;* what are called in the south of England *grigs, gluts,* or *snigs,* are a variety of the common eel with larger head, blunter nose, and thicker skin. *Silver eels* owe probably their distinction of colour to the clear and gravelly streams in which they feed.

Eels are considered in highest perfection for the table from the commencement of spring till about the end of July; yet they continue good till the end of September. The modes of cooking them are numerous and well known. In some parts of the continent of Europe, the skins are made into a kind of ropes which have great strength and durability. The inhabitants of several of the districts of Tartary use them in the place of glass for windows: and in the Orkney Islands they are worn as a remedy for the cramp. Bits of eel-skin are not unfrequently put into coffee to clarify it. In many parts of the north of Europe the scales, which are extremely minute, are mixed with cement to give a silvery lustre to the houses.

The CONGER, or SEA EEL, *Muræna conger*, is chiefly distinguished from the common eel by the lower jaw being shorter than the upper, and the lateral or side line being white.

It is found in all the European seas, and when at its full growth, measures from six to twelve feet in length, and from twelve to twenty inches in circumference.

So numerous are congers on some of the British shores, that, from Mount's Bay, in Cornwall, there have in some years been more than ten tons' weight of dried congers exported to different parts of Spain and Portugal. These fish are also peculiarly abundant in the neighbourhood of the Orkneys and Hebrides. They are chiefly caught with strong lines, each about 500 feet in length, and having sixty hooks placed about eight feet asunder. These lines are sunk in the sea, and sometimes so many of them are fastened together that they extend nearly a mile in length.

The flesh of the conger is white, but coarse and greasy; and, though frequently eaten, is to some persons extremely disgusting. In the salting and drying of these fish they shrink to less than one-fourth part of their original weight, and the process is attended by the most nauseous stench. By the Spaniards and Portuguese dried congers are ground or beaten into powder, to thicken and give a relish to soups.

EFFERVESCENCE, in chemistry, is a rapid disengagement of gas taking place within a liquid; in consequence of this numerous bubbles rise to the surface, forming a head of froth, and bursting with a hissing noise.

EFFLUVIUM, a term used to express the minute particles which exhale from most, if not all, terrestrial bodies in the form of insensible vapours.

EGG, a body formed in certain female animals, and which contains an embryo or fetus, beneath a cortical surface, or shell. This shell is lined throughout with a thin, but tough membrane, which, dividing at or near the obtuse end of the egg, forms a small bag, and contains what is called the *albumen*, or white, and the *vitellus*, or yolk.

The chick in the egg is first nourished by the white, and when that is consumed, by the yolk. A short time before the exclusion of the animal, the whole of the yolk is taken into its abdomen, and the shell, at the obtuse end, frequently appears cracked, which is occasioned by the instinctive operation of the beak.

Eggs vary much in their colour, size, and form, according to the birds that deposit them, and the different modes of dressing them. Those chiefly used for culinary purposes are the new laid eggs of hens, being without exception the most wholesome.

Eggs are an agreeable and nourishing food; but they ought to be perfectly fresh, and then boiled for three minutes. To ascertain whether they have been well preserved, it is only necessary to examine their transparency by a candle, and to reject all such as appear of a turbid colour, or that are not quite full on being shaken: fresh eggs also, on being exposed to the fire, will exhale a perceptible moisture.

[Eggs are very easily preserved by greasing them with hogs' lard, and then putting them in a keg of salt, in a cool place, turning the keg every day; or, put them in a net, and dip them for one minute in boiling water, then put them by, in salt, or bran.—T. C.]

The shells of eggs serve for various purposes, but chiefly as a colour; when finely levigated, they are preferred to flake-white. They are prepared by peeling off the inner skin, and after being finely pulverised, the powder is carefully washed. See Colour-making.

The yolks of eggs are employed in different medicinal ways, but most frequently in emulsions. One yolk, if gradually beaten up with three ounces of pure water, and reduced to the utmost degree of thinness, has been used for contractions of the limbs. [The whites are, according to D'Orfila, a specific against the poison of corrosive sublimate.—T. C.]

ELASTICITY, or elastic force, that property of bodies whereby they restore themselves to their former figure, after any external pressure; being the same with what is otherwise called springiness, very observable in a bent bow, steel springs, and the like. A perfectly elastic body, is that which restores itself with the same force wherewith it was bent, or depressed; those which do not restore themselves with exactly the same force, being called imperfectly elastic bodies. Philosophers account for elasticity from the principles of the attraction and repulsion of bodies: thus, if a steel spring, wire, or piece of very thin glass, be bent out of its natural position, the particles on the convex part are forced from the intimate union they had before; and, on the concave part, they are forced nearer together, or harder upon each other, than in the natural state: in both which cases, there will be a considerable resistance to overcome, and consequently require a superior force. During this state of the particles, they may be said to be under a sort of tension on one side, and compression on the other; and, since by this force they are not drawn out of each other's attraction, as soon as the force is remitted or ceases to act, the attractive power reduces the particles, and unbends the wire. Now it is well known, that many substances are composed of such fibrous parts or filaments which resemble fine wires, and are interwoven and disposed in such a manner, as in sponge, for instance, that they cannot be compressed without being bent or wrested from their natural position; whence all such bodies will, in such cases, exert a spring or force to restore themselves, in the same manner that the bent wire did. All known bodies are in some degree or other elastic, but none of them perfectly so; such are most metals, semi-metals, stones, and animal and vegetable substances, however they may differ in degree. Elasticity seems to vary, according to the different densities of bodies; for the more metals are hammered, the more elastic they become.

ELDER, or *Sambucus*, L. a genus of plants consisting of six species, two of which are indigenous.

1. The *Ebulus*, Dwarf Elder, or Dane-wort, which is perennial, grows in hedges and on road sides, and flowers in the month of July. The green leaves of this plant are said to expel mice from granaries: neither hogs, cows, goats, sheep, nor horses, will eat them. Its berries impart a violet colour, and their juice mixed with vinegar dyes raw linen, as well as Morocco leather, of an azure blue. In its medicinal effects it is more violent than the following species, and therefore requires greater caution.

2. The *nigra*, or Common Elder, which thrives in woods, and damp hedges. In May or June it produces white flowers, which are succeeded by black berries. This plant is extensively useful: its wood being hard and tough, is made into meat-skewers, tops for angling rods, and needles for weaving nets; it is also employed by turners, as it works extremely well on the lathe. The leaves are eaten by sheep, to which it is of great service, when diseased with the rot; for, if placed in a situation where they can easily reach the bark and young shoots, they will speedily cure themselves. According to Linnæus, the plant is refused by horses, cows, and goats, though others assert, that cows eat it eagerly.

Every part of this, as well as of the preceding species, has a narcotic smell, which ought to caution persons against sleeping beneath its shade. The inner green bark, is an ingredient in the black dye; it is likewise purgative, and may be used with advantage where strong laxatives become requisite. In small doses it is diuretic, and has been successfully used in glandular obstructions, and in dropsies. The leaves are possessed of cathartic properties similar to those of the bark, but are more nauseous. They form an ingredient in several cooling ointments: and if turnips, cabbages, fruit-trees, or corn, be whipped with them, and also with the green boughs, they will be effectually secured against the depredations of turnip-flies, caterpillars, and other noxious insects, with which those vegetables are infested. The flowers are sometimes infused to impart a flavour to vinegar; but should on no account be given to turkies, as they will prove fatal to those birds. The berries are likewise poisonous to poultry; but their juice, when boiled down to an extract, and sweetened with sugar, (this composition being termed *rob*), is a gentle aperient, and promotes perspiration. The juice is likewise converted into a pleasant liquor called *elder-wine*, and is also employed to communicate a red colour to raisin or sweet wines. DAMBOURNEY observes, that linen may be dyed of a brown colour with the juice of these berries; and that wool, previously managed with bismuth, acquires a beautiful blueish grey, which is very permanent. In Germany, a very pure and strong spirit is distilled from this fruit, especially after it has been sweetened by night-frosts.

On the trunk of the common elder frequently appears a fungous excrescence, wrinkled, and turned up like an ear, whitish on the outside, black within, and intersected with several small veins. These are commonly called *Jew's ears*, and are reputed to be serviceable for inflammations and swellings of the tonsils; for sore throats, and quinsies.

ELECAMPANE, or *Inula*, L. a genus of plants, consisting of thirty species, of which four only are indigenous, and the principal of these is the *Helenium*, or COMMON ELECAMPANE; which is perennial, abounds in moist meadows and pastures, and flowers in July or August. It is eaten by horses and goats, but refused by hogs: its roots, when bruised and macerated in urine with balls of ashes and whortle-berries, dye a blue colour: when dry they possess an aromatic smell, and, on chewing them, become acrid and pungent: they are likewise in some repute for promoting expectorations in asthmas and coughs. If liberally taken, they are diuretic, and said to be of great service in removing visceral obstructions. A decoction of this plant has been employed by farmers for the cure of the scab in sheep; and, externally applied, for removing disorders of the skin. Prof. KNACKSTEDT, of St. Petersburgh, has lately prescribed the elecampane both ways, and found it a remedy of singular efficacy, in curing the scald head, itch, &c.

ELECTRICITY, the operation of a fluid, extremely subtile and in general invisible; but which is sometimes the object of the senses, and discovers itself to be one of the principal agents in nature.

The name is derived from *electrum*, amber, a substance the attractive power of which was observed at least six hundred years before the Christian era: electricity, however, scarcely became a distinct object in science before the commencement of the seventeenth century, when a book, containing accounts of several electrical experiments, was written by Dr. WILLIAM GILBERT; and it is only since the year 1745, when the *Leyden* phial was discovered, that it has advanced with any considerable rapidity. The theory is still a matter of doubt and controversy, or rather, one concerning which no one presumes to speak decidedly: to describe electricity, therefore, it is necessary to relate a vast variety of facts: an undertaking too voluminous for this work, wherein it shall only be attempted to prepare the reader for whatever he may meet with on the subject, by defining the technical terms. Electrics are non-conductors; and conductors non-electrics. An electrician divides all substances into two classes: 1. *Non-conductors*, or those electrical by themselves, as glass, amber, sealing-wax, &c. which are sometimes called *electrics per se*; 2. *Non-electrics*, or those which though incapable of being *excited*, can yet, in certain circumstances, convey the electric power from one body to another: these are also called *conductors*; the most perfect of which are metals, charcoal, and water.

The effects of the electric fluid, whether by attraction or repulsion, or by emitting streams, or pencils as they are called, of blue light, are all classed under the general word *electricity*; and any body to which that power of attraction, repulsion, &c. is communicated, is said to be electrified: if its virtue is inherent in itself, it is said to be *excited*.

If you take a clean and dry glass tube, and rub it up and down several times with a dry and rather warm piece of flannel, the tube will be excited, and will, if presented to any small light substances, attract and repel them alternately.

If the tube be excited in the dark, and the knuckle be presented to it, a spark will be seen passing between the finger and the tube, accompanied by a snapping noise, and the sensation of pain. The noise and sensation in this experiment, and the attraction and repulsion in the other, are electrical effects.

Electrics, as has been observed, are also called non-conductors; a name which they have obtained from their power of stopping the communication of the electric virtue from one body to another: thus, though a *conductor* be properly placed for receiving the virtue from an excited electric, none will pass to it, if any *electric* substance be interposed; or if the *conductor* be terminated by an electric, none will pass beyond the place where the electric substance begins.

Insulation, is a term used when a *conducting* or non-electric substance is placed upon an electric, so that any power communicated to it cannot pass off. Respecting electrics and non-electrics, it is however necessary to observe that the definitions must be understood with some degree of limitation; for there is no substance either a perfect electric, or a perfect conductor: the most complete conductors making, when they are of great length, a sensible resistance to the passage of the fluid through them; and the most complete electrics being in some degree conductors.

Electricity is found to be of two kinds, *negative* and *positive;* but in what the difference consists is not ascertained. These two electricities are sometimes called the *vitreous* and *resinous;* the former usually belonging to glass, and the latter to amber, gum, and similar substances.

If a small pith ball, suspended on a silken thread, be brought near the tube when excited, the tube will attract the ball, and the ball will become positively electrified, that is, will have more than its natural share: if another ball be treated in the same way, and then the two brought together, they will repel one another.

If a roll of sealing wax or other resinous substance be excited, and a pith ball be brought near it, the ball will be attracted: and if another be placed in the same situation, and then the two made to approach, they will repel one another.

But if a ball that has been excited by the glass be brought near one that has been excited by the wax, they will then attract each other. These experiments prove that bodies similarly electrified repel each other, and that bodies dissimilarly electrified attract each other.

To explain these facts, it is supposed that the glass tube by being excited possesses more than its natural share of the electric fluid, part of which it gives to the ball brought near it, and that the wax by excitation parts with some of its electricity and has less than its natural share, and of course takes away a part of that contained in the ball placed near it. When therefore these balls are brought together they attract one another to restore the equilibrium: that is, the one positively electrified gives out its superabundance to that which is negatively electrified, or which has less than its natural portion.

Some are of opinion that the electric fluid is the matter of *light;* and its influence is observed in all the departments of nature.

It is now ascertained that lightning and electricity are the same; that is, lightning is the rapid motion of vast masses of the electric matter, and thunder is the noise produced by the motion of lightning. Metallic points silently attract electricity from the bodies charged with it, hence the use of pointed conductors to secure buildings from the effects of lightning. The Auroræ Borealis, or northern lights, are the effects of the electric fluid passing through highly rarefied air.

Earthquakes, whirlwinds, and waterspouts are generally accompanied with, and dependent upon electrical phenomena. There are three kinds of fish that possess the power of giving the electrical shock similar to that which is experienced from the Leyden-jar: these are the Torpedo, the Gymnotus, and the Silurus Electricus.

Electric sparks, shocks, &c. have been applied to the cure of various diseases: but as many *professional electricians* are little concerned about the propriety or safety of this potent remedy, when patients apply to them as candidates for the operation, we think it our duty to give the following practical hints: 1. Electricity is always improper in active, inflammatory, or *sthenic* diseases; 2. It is also hurtful when a high degree of excitement is felt in the organs of sense, as well as in those of voluntary motion, and when both are accompanied with relaxation or debility: 3. If any local irritation prevail in the body, such as ulcers, inflammatory tumours, eruptions of the skin, &c. In these cases, the electric stimulus has a direct tendency to produce congestions, or a local accumulation of humours. It has, however, sometimes been found highly beneficial in removing the periodical obstructions of females, though its application requires great precaution. In passive, chronical, or *asthenic* disorders, it has likewise been of considerable service; but the mode of imparting the electric fluid deserves more attention than has, in general, hitherto been bestowed upon it; and violent shocks, for the sake of experiment, ought never to be communicated, where less powerful ones might be sufficient. Thus, the *electric bath*, and the gentle application of sparks to any particular part of the body, under the conditions before stated, are equally safe, and advantageous. On the contrary, the more violent methods of electrifying have so often been attended with mischievous effects, that they ought to be applied to those persons only, whose capacity of receiving external impressions is diminished, and whose excitability is in a languid state.

Deafness, paralysis, head, and toothachs, however obstinate, have frequently yielded to the powerful effects of electricity. Similar success has attended its application to parts affected with the cramp, gouty and rheumatic pains, palsy, and sometimes even epilepsy; besides which, moderate electric shocks have, in various instances, contributed to the resuscitation of persons whose vital functions were destroyed by drowning: it ought, nevertheless, to be resorted to only under the immediate inspection of a medical practitioner. [Its success is never certain.—T. C.]

ELECTUARY, a form of medicine, consisting of powders, or other ingredients, incorporated with honey, conserve or syrup: it is divided into doses, to be taken as circumstances may require.

ELEPHANT, a well known animal, which is a native of India, and the southern parts of Africa. It is the largest of all quadrupeds, and generally about 8 or 9 feet high, very seldom indeed 10 feet. It has no fore-teeth in either jaw; but its dog-teeth are very long, and afford the beautiful ivory, which is converted into combs and other useful articles. It is also provided with a long pliable proboscis, or snout, with which it can seize any objects, and also convey its liquid nutriment to the mouth. It is of a dingy brown colour, hardly any hair; the tusks of the male longer than those of the female. Each foot has five rounded hoofs; the tail short, terminated by a few short black hairs.

Elephants are remarkable for their uncommon sagacity, as well as their social disposition. When tamed they are the most friendly of all animals, and can easily distinguish their master's or driver's voice. They are sensible of the language of anger, of command, and of satisfaction, so that they act accordingly. They receive orders with attention, and execute them with precision and alacrity, bowing themselves for the convenience of those who wish to mount them: raising burdens with their trunk; and laying them on their back. These animals delight in shining harness and trappings; though when yoked in a cart or wagon, they draw cheerfully, unless abused by unjust chastisement, in which case they seldom fail to take vengeance on their tyrannical master.

Throughout the whole of the East Indies, as well as in several other parts of Asia, the elephant is an animal of indispensable utility. They are formed in a particular manner for the service of man in hot climates. They are employed both as beasts of draft and burden; and one elephant is supposed equal to as much work as six horses. They are conducted by a man who sits on their neck, and employs as a weapon an iron rod, hooked at the end, with which he pricks the animal to urge him forward, or turn him in any direction that may be required. Almost all the articles which are transported from place to place in India are conveyed by elephants. Before the invention of gunpowder, elephants were much employed by the Indians in their wars. They are now chiefly used for the purposes of labour and parade.

They require much attention, and are generally fed with rice, either raw or boiled, and mixed with water, of which each elephant will devour daily near 100 pounds' weight, besides a certain quantity of fresh herbage which is procured for him. They are led to the water thrice a-day, both to drink and bathe; and their daily consumption of water for drink has been estimated at forty-five gallons each.

The modes in which elephants are caught and domesticated are curious and interesting. In a wild state they inhabit, in large troops, the thick and boundless forests of Asia and Africa. To obtain the single male elephants it is customary in some parts of India to employ females, which are trained for that particular purpose. When the hunters have discovered a male elephant that suits them, they conduct four of the females silently and slowly, at a little distance from each other, nearly to the place where he is feeding. If, as frequently is the case, he permit their approach, two of them are conducted, one on each side close to his neck, a third places herself across his tail, and the fourth is brought up by proper attendants, who immediately pass under the animal and tie his legs with ropes. After this he is further secured; and at length, though not without much difficulty, is conveyed home and domesticated.

When the elephants of a whole herd from 40 to 100 in number are to be secured, a party consisting sometimes of 500 persons are employed. These, by fire and noises, drive them into the inclosures in which they are to be secured; an operation which generally occupies several days. These inclosures are three in number, and communicate with each other by narrow openings or gateways. The opening of the outer inclosure is disguised as much as possible by bamboos and branches of trees stuck into the ground, so as to make it look like a natural jungle. It is not without much difficulty that the leader can be induced to enter, but after he has passed, all the others immediately follow. There is still greater difficulty in inducing them to pass into the second and third inclosures; and lastly, one by one into the romee, an outlet about sixty feet in length, and so narrow that the animals are unable to turn round in it. Here, after in vain exerting all their powers to break down the fences and escape, they are all in succession secured by ropes that are fastened round their legs.

To domesticate them, they are now each placed under a keeper, who is appointed to attend and instruct them. After the elephant has for some days been supplied with food and water, the keeper ventures to approach him. He strokes and pats him with his hand, at the same time speaking to him in a soothing voice; and after a little while the beast begins to know and obey him. By degrees the keeper become familiar; he ventures to mount upon his back from one of the tame elephants, and at length seats himself on his neck, from whence he afterwards regulates and directs all his motions. In a few weeks the animal becomes obedient; his fetters are by degrees taken off; and, in the course of six months, he submits entirely to his keeper's will.

Wild male elephants are frequently hunted and killed, both in Asia and Africa, on account of their tusks, which, under the name of *ivory*, are a very important article of traffic. The temptation held out at the Cape of Good Hope to this dangerous pursuit, in which many of the hunters are destroyed, is the payment of a guilder per pound for the tusks; and these weigh from 30 to 130 pounds. For the whitest, smoothest, and most compact ivory that is known we are however indebted to the island of Ceylon. The whole quantity of ivory exported from the Cape of Good Hope in four years, ending in 1804, amounted to 5981 pounds; and the average annual quantity vended at the East India Company's sales from 1804 to 1808 was twenty-six tons.

The principal consumption of ivory is for making ornamental utensils, mathematical instruments, boxes, combs, dice, and an infinite variety of toys. There are many exquisite pieces of workmanship in ivory. This substance is also used for painting miniatures upon, for which however it goes through a peculiar preparation. It is capable of being stained of various and very beautiful colours. The shavings of ivory, like those of hartshorn, may by boiling be converted into a jelly; and they possess similar virtues. Bone is frequently substituted for ivory, but it is easily distinguished by its pores, which are not to be seen in ivory, and by its wanting the beautiful white veins or marks by which ivory is distinguished.

The *flesh* of the elephant is eaten by the negroes of Africa; and its *skin* is convertible into a strong and valuable kind of leather. The ancients had a notion that ivory shavings mixed with honey would dissipate freckles on the face. They also attributed many medicinal qualities to the *blood* and the *trunk*.

ELIXIR. See TINCTURE.

ELK. See DEER.

ELL, a measure of length, different in different countries; but those mostly used in England are the English and Flemish ells; the former, three feet nine inches, or one yard and a quarter; and the latter only 27 inches, or three quarters of a yard. In Scotland the ell contains 37 2-10ths English inches.

ELM-TREE, the COMMON, or *Ulmus Campestris*, L. a tree, growing chiefly in a loose soil of hedge-rows, and abounding in the more southern parts of England. Its flowers have a pleasant smell, similar to that of violets, and blow in the month of April.

This beautiful tree is of great value; and well adapted for planting shady walks, as it does not destroy the grass, and its leaves are relished by horses, cows, goats, hogs, and sheep, all of which eat them eagerly. Its wood, being hard and tough, is used for making axle-trees, mill-wheels, keels of boats, chairs, and coffins: it is also frequently changed by art, so as completely to resemble mahogany; for this purpose it is sawed into thick planks, stained with aqua-fortis, and rubbed over with a tincture, of which alkanet, aloes, and spirit of wine, are the principal ingredients.

This plant affords subsistence to a variety of insects that prey upon it, but more particularly to the *aphis* of the elm, which generally causes the leaves to curl, so as to make them a secure shelter against the weather. No effectual method of extirpating them has hitherto been devised. Silk-worms devour the leaves with great avidity; and though we doubt whether they afford wholesome food to these insects, yet when alternately given or mixed with lettuce, elm-leaves may become an useful substitute, in situations where the mulberry-tree is scarce.

A decoction of the inner bark of the elm-tree, if drunk freely, has sometimes procured relief in inveterate dropsies. It has a bitterish taste, and abounds with a slimy juice, which is recommended in nephritic cases, and also externally as an useful application to burns. The outer bark is bitter, contains but little mucilage, and is totally destitute both of smell and taste. The internal bark of the branches is more bitter than that of the trunk, and is, probably on that account more efficacious. It is chiefly used for cutaneous complaints, such as the herpes, or shingles, and the leprosy.

We have two species of the *ulmus*, or elm, in the United States, viz. the red, or slippery elm; the *Ulmus Americana*, or American rough-leaved elm of MARSHALL, (*Ulmus Rubra* of Muhlenburg;) 2d. *Ulmus Molifolia*, American soft-leaved elm.

The first mentioned species, on account of its many valuable properties, deserves particular mention. It rises to the height of 30 feet, with a pretty strong trunk, dividing into many branches, and covered with a light coloured rough bark. The leaves are oblong, oval, and sharp pointed, unequally sawed on their edges, unequal at the base, very rough on their upper surface, and hairy underneath. The flowers are produced thick upon the branches, upon short, collected footstalks, and are succeeded by oval, compressed, membranaceous seed-vessels, with entire margins, containing one oval compressed seed. The inner bark by infusion or gentle boiling in water, affords a great quantity of insipid mucous substance, a fact that may be of service to travellers who may lose their way in our wilds.

The late Dr. JOSEPH STRONG, of Philadelphia, stated, that during the time he served as surgeon in the western army, he experienced the most happy effects from the application of poultices of the elm bark to gun-shot wounds, which were soon brought to a good suppuration, and to a disposition to heal. It was applied as the first remedy. When tendency to mortification was evident, this bark bruised, and boiled in water, produced the most surprising good effects. After repeated comparative experiments with other emollient applications, as milk and bread, and linseed poultice, its superiority was firmly established. He thinks that the mucilage is slightly sweet. He particularly stated the cases of the wounded in the action in which general WAYNE defeated the Indians in August 1794, as proving, in the most evident manner, the beneficial effects of the poultice. In old ill-conditioned ulcers, in fresh burns, equal benefit was derived from it. In diarrhæas and dysenteries, the infusion of the bark was used with advantage as a diet drink. A soldier, who had lost his way, supported himself for ten days upon this mucilage and sassafras. The red elm tree may be considered as a highly valuable addition to our stock of medicines, exclusively American, and ought to be carefully searched for by the medical gentlemen in the country, and preserved from the indiscriminate axe.

ELOCUTION, generally speaking, signifies the selecting and adapting of words and sentences, to the things or sentiments intended to be expressed. It is also used to denote the just and graceful management of the voice, countenance, and gesture, when speaking: in which sense it is synonymous with what is variously called a good delivery, eloquence, or the art of speaking and writing with accuracy, elegance, and perspicuity.

ELONGATION, in astronomy, the digression or recess of a planet from the sun, with respect to an eye placed on our earth. The term is chiefly used in speaking of Venus and Mercury, the arch of a great circle intercepted between either of these planets and the sun, being called the elongation of that planet from the sun.

But here it is to be observed that it is only a circle which has the sun for its centre; that the greatest elongation is in a line touching the planet's orbit. For in an elliptic orbit it may be, that the elongation from the sun may grow still greater, even after it has left the place where the line joining the earth and planet touches the orbit. For after that, the true distance of the planet from the sun may increase, whilst the distance of the sun and planet from the earth does not increase, but rather decrease. But, because the orbits of the planets are nearly circular, such small differences may be neglected in astronomy. The greatest elongation of Venus is found by observation to be about forty-eight degrees, and the greatest elongation of Mercury about twenty-eight degrees, upon which account this planet is rarely to be seen with the naked eye.

Elongation, angle of, is an angle contained under lines drawn from the centre of the sun and planet to the centre of the earth.

ELOQUENCE, the art of speaking well, so as to affect and persuade. Cicero defines it, the art of speaking with copiousness and embellishment. Eloquence and rhetoric differ from each other, as the theory from the practice: rhetoric being the art which describes the rules of eloquence, and eloquence that art which uses them to advantage.

EMBALMING, is the opening a dead body, taking out the intestines, pickling it with salt-petre, and filling the place with odoriferous and desiccative drugs and spices to prevent its putrifying. The Egyptians have always been celebrated for their adherence to this practice, and the skill with which they performed it. With some variation, it is still one of the peculiar customs of that nation. It appears to have been a metaphysical notion, inculcated as of their religion, that the soul continued with the body. There naturally followed an affectionate desire to do every thing that living creatures can suppose acceptable to the dead. They were even desirous of having the dead bodies of their parents in their houses, and at their tables, and believed, as has been suggested, that their souls were present also; and it was essential to this gratification that those bodies should be preserved in the most perfect manner possible.

EMBARGO, in commerce, an arrest on ships, or merchandise, by public authority; or a prohibition of state, commonly on foreign ships, in time of war, to prevent their going out of port; sometimes to prevent their coming in; and sometimes both, for a limited time. Embargo differs from *quarantine*, insomuch as this last is always for the term of forty days, in which persons from foreign parts infected with the plague, are not permitted to come on shore.

EMBOSSING, in architecture and sculpture, the forming or fashioning works in relievo, whether cut with a chisel, or otherwise. Embossing is a kind of sculpture, wherein the figures project from the plane whereon it is cut; and according as the figures are more or less prominent, they are said to be in alto, mezzo, or basso relievo: or high, mean or low relief.

EMBROIDERY, a work in gold, or silver, or silk-thread, wrought by the needle upon cloth, stuffs, or muslin, into various figures. There are several kinds of embroidery; as, 1. Embroidery on the stamp, where the figures are raised and rounded, having cotton or parchment put under them to support them. 2. Low embroidery, where the gold and silver lie low upon the sketch, and are stitched with silk of the same colour. 3. Guimped embroidery; this is performed either in gold or silver; they first make a sketch upon the cloth, then put on cut vellum, and afterwards sew on the gold and silver with silk-thread; in this kind of embroidery they often put gold and silver cord, tinsel, and spangles. 4. Embroidery on both sides; that which appears on both sides of the stuff. 5. Plain embroidery, where the figures are flat and even, without cords, spangles, or other ornaments.

EMERALD, a species of precious stones, perhaps the most beautiful of all the gems. [It is usually found under the form of a short six-sided prism.—T. C.] When heated in fire, it changes its colour to a deep blue, and becomes phosphorescent; it resumes its natural green on growing cold.

Emeralds are divided by jewellers into two classes or kinds, namely, the *oriental* and the *occidental*. The former is at present extremely scarce, being found only in the kingdom of Cambay, in India. The *occidental* emeralds are chiefly imported from Peru in South America. A very inferior sort is also obtained from Silesia, which, however, is little esteemed. The emerald is coloured by chrome.

By the ancients the emerald was in great request, particularly for engraving upon. They are said to have procured it from Ethiopia and Egypt. The most intensely coloured and valuable emeralds that we are acquainted with are brought from Peru. They are found in clefts and veins of granite, and other primitive rocks, and oftentimes grouped with the crystals of quartz, felspar, and mica.

The emerald is one of the softest of the precious stones: and is almost exclusively indebted for its value to its charming colour. The brilliant purple of the ruby, the golden yellow of the topaz, the celestial blue of the sapphire, are all pleasing tints; but the green of the emerald is so lovely, that the eye, after glancing over all the others, finds delight in resting upon this. In value it is rated next to the ruby; and when of good colour, is set without foil, and upon a black ground, like brilliant diamonds. Emeralds of inferior lustre are generally set upon a green gold foil. These gems are considered to appear to greatest advantage when table cut, and surrounded by brilliants, the lustre of which forms an agreeable contrast with the quiet hue of the emerald. They are sometimes formed into pear-shaped ear-drops; but the most valuable stones are generally set in rings. A favourite mode of setting emeralds, among the opulent inhabitants of South America, is to make them up into clusters of artificial flowers on gold stems.

The largest emerald that has been mentioned is one said to have been possessed by the inhabitants of the Valley of Manta, in Peru, at the time when the Spaniard's first arrived there. It is recorded to have been as big as an ostrich's egg, and to have been worshipped by the Peruvians, under the name of the Goddess, or Mother of Emeralds. They brought smaller ones as offerings to it, which the priests distinguished by the appellation of daughters. Many fine emeralds are stated to have formerly been bequeathed to different monasteries on the continent of Europe; but the greatest part of them are said to have been sold by the monks, and to have had their place supplied with coloured glass imitations. These stones are seldom seen of large size, and at the same time entirely free from flaws.

The precious stone called oriental emerald is a green and very scarce variety of the oriental ruby.

The *Beryl*, or *Aqua Marine*, is a light or mountain green variety of the emerald, sometimes straw-coloured, blueish, yellow, or even white.

These stones are of such frequent occurrence, even in large pieces perfectly clear and free from flaws, are in general, so soft, and have so little the brilliancy of other gems, that they are generally considered of very inferior value. The most beautiful kinds are brought from Dauria, on the frontiers of China, from Siberia, and from Brazil. They are also found in Saxony and the south of France, and are very common about Baltimore.

They are cut by means of emery, and polished with tripoli. The darkest green specimens are set upon a somewhat steel-coloured foil; and the pale ones are either placed, like the diamond, on a black ground, or upon a silvery foil. The aqua marine is usually made into necklaces; but is likewise employed for broaches, and not unfrequently for seal stones and entaglios. The larger ones are in much esteem among the Turks for the handles of stilettoes.

Genuine emeralds being seldom to be met with, several experiments have been made, and directions given for imitating them; such as the following: Take of natural crystal and of red lead, each 4 ounces; verdigris 48 grains; and of crocus martis 8 grains. The whole is to be finely pulverised, sifted, and put into a crucible, the space of one inch being left empty. It is then to be well luted, set in a potter's furnace, and left for the same space of time as earthen ware. When cool, the crucible is to be broken, and these ingredients will be found converted into a mass of a fine emerald colour; which, after being properly cut and set in gold, will imitate the genuine oriental emerals. [For verdigris use oxide of chrome.—T. C.]

EMERSION, in astronomy, is when any planet that is eclipsed begins to emerge or get out of the shadow of the eclipsing body. It is also used when a star, before hidden by the sun as being too near him, begins to re-appear or emerge out of his rays.

EMERY, a kind of metallic stone, found in several mines, in the islands of Guernsey and Jersey, and at Naxos and other islands in the Grecian Archipelago. It classes with corundum or adamantine spar, and is used for the same purposes, but chiefly in those of iron, being a species of rich ore. It is usually of a dusky brownish red on the surface; but, when broken, is of a fine bright reddish iron-grey, spangled with glittering specks, which are in a considerable degree impregnated with that metal. It is also sometimes red, and contains veins of gold.

This stone, or ore, is employed for polishing and grinding hard substances, and is consumed in considerable quantities, by locksmiths, glaziers, lapidaries, masons, cutlers, and others, who employ it for cutting and polishing glass, marble, and precious stones; as well as for the polishing and burnishing of articles made of iron and steel. This species of emery is of a brownish colour, inclining to red; is extremely hard, and consequently, very difficult to be reduced to powder; which is effected by means of certain mills, invented for the purpose: when pulverised, it forms a considerable article of exportation.

EMETICS, are those medicines which are either given with a view to discharge the foul or poisoned contents of the stomach, or to vellicate the coats of that organ, and thus to produce certain changes in other parts of the animal economy, not immediately connected with the process of digestion. With the latter intention, small nauseating doses are generally administered, especially in catarrhal and other diseases of the breast. In this place, however, we shall but briefly enumerate the cases in which vomiting may be excited, with a probability of success; and also, those instances in which this remedy cannot be safely adopted.

Emetics may be of great service: 1. Immediately after swallowing narcotic and other poisons (see Antidotes, vol. i.); 2. For the purpose of evacuating viscid, bilious, and putrid matters, or undigested food from the stomach; 3. To assist nature, when there is a spontaneous effort to vomit; 4. To expel substances fallen into and obstructing the passage of the gullet; 5. To promote the expectoration of mucus and purulent matter, collected in the lungs and wind-pipe; as well as on many other occasions.

On the contrary, the greatest precaution is required in the following cases, where a precipitate use of emetics may be attended with fatal effects, from bursting a blood vessel, &c. 1. In all plethoric persons, but especially such as perceive a strong propulsion of the blood to the head, breast, stomach, or liver; 2. In actual inflammation of the intestines; 3. In states of extreme languor and debility; 4. In every species of ruptures, and prolapses; 5. In violent pain proceeding from stones confined in the bilious or urinary passages; 6. In obstructions of the bowels, and other abdominal parts; 7. In persons of very rigid fibres, for instance, the aged and emaciated; 8. In a very weak or affected state of the lungs, liver and stomach; 9. In a deformed structure of the body, or some particular parts; for which reason emetics might prove dangerous to persons troubled with a hump-back, a very short neck, narrow chest, &c.

ENAMEL, in general, signifies a vitrified matter, interspersed with some solid substance; and possessing all the properties of glass, excepting that of transparency.

The basis of enamels is a pure crystal glass or frit, ground together with oxide of lead and tin, prepared for that purpose, with the addition of a small proportion of salt of tartar. These form the principal ingredients of all enamels, which are made by adding various pulverised colours, and thoroughly incorporating the whole in a furnace. For white enamel, it is sufficient to add a very little manganese to the matter which constitutes the basis; for azure, saffre mixed with calx of brass; for green, calx of brass with scales of iron, or crocus martis; for black, zaffre with manganese or crocus martis, or manganese with tartar; for red, manganese, or calx of copper with red tartar; for purple, manganese with calx of brass; for yellow, tartar and manganese; lastly, for violet coloured enamel, manganese with brass, three times calcined.

Enamels are used either for the counterfeiting or imitating of precious stones, and for painting; or by enamellers and artists working in gold, silver, and other metals. That species of white enamel which jewellers employ, is imported from Holland, or Venice, in small cakes of various sizes, which are in general, about four inches in diameter, and have the mark of the maker indented on them.

The artist who is desirous to see the latest improvements in this art detailed, is referred to Tilloch's *Phil. Magazine*, (vol. i.) and Nicholson's *Journal*, (8vo. 3 vol.) In the latter, all the processes of the Sevre China manufactory, are detailed by the principal of the establishment.

Enamelling, is the art of laying enamel upon metals, such as gold, silver, copper, &c. whether plain or painted. The latter process is performed on plates of gold or silver, but generally on those of copper, prepared with the white enamel; on which certain objects are delineated with the colours, and afterwards burnt in the fire, where they acquire a brightness and lustre resembling glass.

Painting in enamel is held in greater estimation than any other branch of that art; on account of its peculiar and permanent vivacity, the strength of its colours not being effaced by time, but always retaining their pristine splendour. It is chiefly employed in miniature, as it cannot be easily performed on a large scale; the enamel being very liable to crack on a plain surface, so that even the smallest plates must be somewhat of a convex form.

ENCHASING, or **Chasing**, the art of enriching and beautifying gold, silver, and other metal work, by some design represented thereon, in low relievo. It is performed by punching or driving out the metal, to form the figure, from within side, so as to stand out prominent from the plane or surface of the metal. For this purpose, a number of fine steel-blocks, or puncheons, of divers sizes, are provided; and the design being drawn on the surface of the metal, they apply the inside upon the heads and tops of these blocks, directly under the lines or parts of the figures; then, with a fine hammer, striking on the metal, sustained by the block, the metal yields, and the block makes an indenture, or cavity, on the inside, corresponding to which there is a prominence on the outside, which is to stand for that part of the figure.

ENGINE, in mechanics, a compound machine, made of one or more mechanical powers, in order to raise, cast, or sustain any weight, or produce any effect which could not be easily effected otherwise. Engines are extremely numerous; some used in war, as the battering ram, ballista, wagons, chariots, &c. others in trade and manufactures, as cranes, mills, presses, &c. others to measure time, as clocks, watches, &c. and others for the illustration of some branch of science, as the orrery, cometarium, and the like. In general, it may be observed, concerning engines, that they consist of one, two, or more of the simple powers variously combined together; that in most of them the axis in peritrochio, the lever, and the screw, are the constituent parts; that in all, a certain power is applied to produce an effect of much greater moment; and that the greatest effect, or perfection, is when it is set to work with four-ninths of that charge which is equivalent to the power, or will but just keep the machine in equilibrio.

ENGINEER, Civil, is a man bred up as a mathematician, chemist and mechanist: whose occupation is, to lay out and construct roads, canals, steam-engines, and machinery of all kinds, and select them according to the purposes for which they are wanted.

Engineer, in the military art, one who, by a perfect knowledge in mathematics, delineates upon paper, or marks upon the ground, all sorts of forts, and other works proper for offence and defence. He should understand the art of fortification, so as to be able, not only to discover the defects of a place, but to find a remedy proper for them, as also how to attack as well as to defend. When, at a siege, the engineers have surveyed the place, they are to make their report to the general, acquainting him which part they judge the weakest, and where approaches may be made with most success. Their business is also to delineate the lines of circumvallation and contravallation, taking all the advantages of the ground; to mark out the trenches, places of arms, batteries, and lodgments, taking care that none of their works be flanked or discovered from the place.

ENGRAVING, the art of cutting metals and precious stones, and representing designs thereon. Engraving, properly a branch of sculpture, is divided into several other branches, according to the matter whereon it is employed, and the manner in which it is performed. The original way of engraving on wood is at present denominated cutting in wood; that on metals with aqua fortis, is named etching; that by the knife, burnisher, punch, and scraper, is called mezzotinto; that on stones for inscriptions, stone-cutting; and that performed with the graver, on metals or precious stones, keeps the primitive name of engraving.

Engraving *on copper* is performed with the graver on a plate which, being well polished, is covered over thinly with virgin-wax, and then smoothed, while warm, with a feather, so that the wax be of an equal thickness on the plate; and on this the draught or design, done in black lead, red chalk, or ungummed ink, is laid with the face of the drawing on the wax; then they rub the reverse side, which causes the whole design of the drawing to appear on the wax. The design, thus transferred, is traced through on the copper, with a point, or needle; then heating the plate, and taking off the wax, the strokes remain to be followed with the graver. In the conduct of the graver consists almost all the art, which depends not so much upon rules as upon practice, and the habitude, disposition, and genius of the artist, the principles of engraving being the same with those of painting; for if an engraver be not a master of design, he can never arrive at any degree of perfection in the art. The instruments necessary for this sort of engraving are, besides a graver, a cushion (or sand bag, made of leather, to lay the plate on, in order to give it the necessary turns and motions); a burnisher, made of iron or steel, round at one end, and usually flattish at the other, to rub out slips and failures, soften the strokes, &c. a scraper, to pare off the surface, on occasion; and a rubber, to fill up the strokes that they may appear the more visible.

In engraving on precious stones, use is made of either the diamond, corundum, adamantine spar, or of the emery. The diamond, which is the hardest of all stones, is only cut by itself, or with its own matter.

Engraving *on steel* is chiefly employed in cutting seals, punches, matrices, and dies proper for striking coins, medals, and counters. Engravers in steel commonly begin with punches, which are in relievo, and serve for making the creux, or cavities, of the matrices, and dies: though sometimes they begin with the creux, or hollowness, but then it is only when the intended work is to be cut very shallow. The first thing done, is that of designing the figures; the next is the moulding them in wax, of the size and depth they are to lie, and from this wax the punch is engraven. When the punch is finished they give it a very high temper, that it may the better bear the blows of the hammer with which it is struck to give the impression to the matrix. The steel is made hot, and, in some degree, decarbonised, to soften it, that it may the more readily take the impression of the punch; and after striking the punch on it, in this state, they proceed to touch up or finish the strokes and lines, where, by reason of their fineness or the too great relievo, they are any thing defective, with steel gravers of different kinds, chisels, &c. being the principal instruments used in graving on steel.

Engraving *on stone*. See **Lithography.**

ENNEANDRIA, the name of the ninth class in Linnæus's sexual system, consisting of plants which have hermaphrodite flowers, with nine stamina or male organs. The orders, or secondary divisions, in this class are three, being founded on the number of the styles, seed buds, or female organs. Laurustinus, and cassytha, have one style; rhubarb (rheum), has a triple stigma or summit, but scarce any style; flowering rush has six styles. The genera just enumerated are all that belong to the class Enneandria. The first genus, laurus, is very extensive: comprehend- the bay-tree, cinnamon-tree, camphor-tree, benjamin-tree, sassafras-tree, and the avocado or avogato pear.

ENTOMOLOGY, the science of insects, a branch of zoology.

Every animal, properly classed among insects, has a head, antennæ, and six or more feet.

The class of insects is divided by **Linnæus** into seven orders:

1. "Coleoptera" (from κωλεος "a sheath," and ϖτερον "a wing,") such insects as have crustaceous *elytra*, or shells, which shut together, and form a longitudinal suture down the back of the insect; as the *beetle*.

2. "Hemiptera" (from ημισυ "half," and ϖτερον,) usually have their upper wings half crustaceous, and half membranaceous, not divided by a longitudinal suture, but incumbent on each other; as the *cimex*, or bug.

3. "Lepidoptera" (from λεπις, "a scale," and ϖτερον,) have four wings, covered with fine scales, in the form of powder or meal; as the *butterfly*

4. "Neuroptera" (from νευρον "a nerve," and ϖτερον,) have four membranous, transparent, naked wings, generally resembling net-work; as in the *panorpacoa*.

5. "Hymenoptera" (from υμην "a membrane," and ϖτερον,) have four membranous wings, and a sting.

6. "Diptera" (from δις "two" and ϖτερον,) have two wings, and *poisers*; as in the fly.

7. "Aptera" (from α "without," and ϖτερον,) have no wings. This last division contains scorpions, spiders, crabs, lobsters, &c.

The general characters by which insects are distinguished are the following: they are furnished with several, six or more, feet; the muscles are affixed to the internal surface of the skin, which is a substance more or less strong, and sometimes very hard and horny; they do not breathe like larger animals, by lungs or gills situated in the upper part of the body; but by a sort of spiracles, distributed in a series or row on each side the whole length of the abdomen; these are supposed to communicate with a continued chain, as it were, of lungs, or something analogous to them, distributed throughout the whole length of the body; the head is furnished with a pair of what are termed antennæ, or horns, which are extremely different in different tribes, and which, by their structure, &c. form a leading character in the institution of the genera into which insects are divided.

Writers on natural history formerly included snails, worms, and the smaller animals, or animalcules, in general, among insects: these are now more properly placed among the tribe vermes, or worm-like animals. Insects have also been denominated bloodless animals, which modern discoveries have shewn to be contrary to fact: some of them, as the cimex lectularius, have been frequently viewed with the microscope, to exhibit in a striking manner the circulation of the blood. In this insect, with a good glass, the vibrations and contractions of the arteries may be distinctly observed.

Most insects are oviparous; of course, the first state in which insects appear is that of an ovum or egg. This relates to the generality of insects, for there are some examples of viviparous insects, as in the genera Aphis, Musca, &c. From the egg is hatched the insect in its second or caterpillar state; this second state has been usually known by the name of eruca, but Linnæus has changed it to that of **Larva**, which see; considering it as a sort of masked form or disguise of the insect in its complete state. The larvæ of insects differ very much from each other, according to the several tribes to which they belong; those of the butterfly and moth tribe (phalæna) are generally known by the name of caterpillars; those of the beetle (scarabæus), except such as inhabit the water, are of a thick, clumsy form. The larvæ of the locust, or grasshopper, (gryllus), do not differ very much in appearance from the complete insect, except being without wings. The larvæ of flies, bees, (musca apis), &c. are generally known by the name of maggots, and are of thick short form. Those of water beetles (dytiscus) are of highly singular forms, and differ, perhaps, more from that of the complete insect than any others, except those of the butterfly tribe. Some insects undergo no change of shape, but are hatched from the egg complete in all their parts, and they undergo no farther alteration than that of casting their skin from time to time, till they acquire the complete resemblance of the parent animal. In the larvæ state, most insects are peculiarly voracious, as in many of the common caterpillars. In their perfect state some insects, as butterflies, are satisfied with the lightest nutriment, while others devour animal and vegetable substances with a considerable degree of avidity. When the larva is about to change into the chrysalis or pupa state, it ceases to feed, and having placed itself in some quiet situation, lies still for several hours, and then, by a sort of effort, it divests itself of its external skin, and immediately appears in the different form of a chrysalis or pupa; in this state likewise, the insects of different genera differ almost as much as the larva. In most of the beetle tribe, the larva is furnished with short legs, capable of some degree of motion, though very rarely exerted. In the butterfly tribe it is destitute of legs; but in the locust tribe it differs very little from the perfect insect, except in not having the wings complete. In most of the fly tribe it is perfectly oval, without any apparent motion, or distinction of parts. The pupa of the bee is not so shapeless as that of flies, exhibiting the faint appearance of limbs. Those of the dragon-fly (libellula) differ most widely from the appearance of the complete insect; from the pupa emerges the insect in its ultimate form, from which it never changes, nor receives any farther increase of growth.

Different naturalists have attempted to arrange insects into families and genera, particularly the celebrated **Linnæus**, whose arrangement may be thus explained. He has formed them into seven families or orders, composing his sixth class of animals, Insecta: he defines an insect, a small animal breathing through pores on its sides, furnished with moveable antennæ and many feet, covered with either a hard crust or a hairy skin. The sexes of insects are commonly two, male and female. Neuters are to be met with among those insects which live in swarms, such as ants, bees, &c.

The majority of insects are observed

to be annual, finishing the whole term of their lives in the space of a year or less, and many do not live half that time: nay, there are some which do not survive many hours; but this latter period is to be understood only of the animals when in their complete or ultimate form, for the larvæ of such as are of this short duration, have, in reality, lived a very long time under water, of which they are natives; and it is observed, that water insects, in general, are of longer duration than land insects. Some few insects, however, in their complete state, are supposed to live a considerable time, as bees for instance: and it is well known that some of the butterfly tribe, though the major part perish before winter, will yet survive that season in a state of torpidity, and again appear and fly abroad in the succeeding spring; spiders are also thought to live a considerable time, and some species of the genus cancer are said to live several years, especially the common lobster, &c. It should be observed, however, that these animals, in the opinion of some modern naturalists, constitute a different tribe of beings from insects properly so called.

ENTRY, Bill of, in commerce, a list of goods shipped, and delivered at the custom-house.

EPACT, in chronology, a number arising from the excess of the common solar year above the lunar, whereby the age of the moon may be found out every year. The excess of the solar year above the lunar is eleven days. Or the epact of any year expresses the number of days from the last new moon of the old year, which was the beginning of the present lunar year, to the first of January. The first year of the *cycle of the moon*, the epact is 0, because the lunar year begins with the solar. On the second, the lunar year has begun 11 days before the solar year; therefore the epact is 11. On the third, it has begun twice 11 before the solar year; therefore the epact is 22. On the fourth, it begins three times 11 days sooner than the solar year; the epact would therefore be 33; but thirty days being a synodical month, must, that year, be intercalated; or that year must be reckoned to consist of thirteen synodical months, and there remains three, which is the true epact of the year; and so on to the end of the cycle, adding 11 to the epact of the last year, and always rejecting the 30, gives the epact of the present year.

To find the epact until the year 1900. Subtract 1 from the golden number, and multiplying the remainder by 11, reject the thirties, and the epact is given.

A Table of the Golden Numbers, and their Corresponding Epacts, till the year 1900.

G. No.	Epact.	G. No.	Epact	G. No.	Epact.	G No.	Epact
1	0	6	25	11	20	16	15
2	11	7	6	12	1	17	26
3	22	8	17	13	12	18	7
4	3	9	28	14	23	19	18
5	14	10	9	15	4		

EPHEMERA, the **Day-fly**, in zoology, a genus of flies belonging to the neuroptera order, and so called from their living only one day and a night: they have two gibbous protuberances on the top of the head, resembling eyes: add to this, the tail is furnished with hairs, and the antennæ are short. To this genus belong a variety of species, differing from each other in the length of their lives. Some live several days, others do not take flight till the setting of the sun, and die before it rises again. They are very various also, as to size. Sometimes, says M. de Saint Pierre, the duration of the life of an animal is proportioned to that of the vegetable by which it is nourished: many caterpillars live and die with the leaves on which they feed. There are insects that exist only five hours, and such is the *ephemera*. This kind of fly, which is about the size of the little finger, springs from a larva which lives in the water, and is particularly found at the mouths of rivers, on the banks, in the mud of which it makes itself a dwelling. This larva is in existence for three years; at the end of which term it changes almost suddenly into a fly, which appears about six in the evening, and dies at eleven at night.

EPIC, or **Heroic Poem**, a poem expressed in narration, formed upon a story partly real, and partly feigned; representing, in a sublime style, some signal and fortunate action; distinguished by a variety of great events; and tending to form the morals, and affect the mind with the love of heroic virtue. [Formerly considered as one of the most praise-worthy efforts of human genius; now that we have past the infancy of society, epic, and all other poetry, is ranked among the subjects of idle amusement, addressed to the imagination only, and of no real use in society. Hence young people cultivate, and as they grow older throw it aside. —T. C.]

EPIDEMIC, in general, denotes a spreading disorder which, as is supposed, arises from some corruption or malignity in the air, and attacks great numbers of people at certain seasons.

The plague, which formerly destroyed great numbers in London, was not always imported, but probably originated at home, where, in those ages, *cleanliness* was not so generally attended to as it is at present. Hence this domestic virtue has guarded its inhabitants against many epidemics, to which other less cleanly nations have been subject. But there is still great occasion for improvements, especially in the houses of the narrow courts and allies of that metropolis.

EPILEPSY, or FALLING-SICKNESS, though hitherto considered an incurable disease, has often been relieved by the conjoint power of medicines and an appropriate diet. Hence, a pure and fresh air, light but nutritive food; cheerful company, and moderate exercise, will be here of greater service than the most celebrated nostrums, which are daily imposed upon the credulous. On the other hand, epileptic patients should carefully avoid all strong and heating, as well as *hot* liquors, which equally relax the stomach; and abstain from all articles of food which they find difficult of digestion. [Epilepsy is very often owing to worms in the intestines.—T. C.]

EPIPHANY, a Christian festival, otherwise called the Manifestation of Christ to the Gentiles, observed on the sixth of January, in honour to the appearance of our Saviour to the magi, or wise men, who came to adore him, and bring him presents.

EPISCOPALIANS, in church-history, an appellation given to those who prefer the episcopal government and discipline to all others. By the test act, none but episcopalians, or members of the Church of England, are qualified to fill any office, civil or military. [The Greek word *episcopos*, which we have anglicised into bishop, means no more than an overlooker or overseer. In like manner the church of England has anglicised the Greek word *baptiso*, which literally means, to immerse, or to dip. —T. C.]

EPOCH, in chronology, a term or fixed point of time, whence the succeeding years are numbered or accounted. See CHRONOLOGY.

EPSOM SALT, was formerly obtained by boiling down the mineral water found in the vicinity of Epsom. It is at present prepared from sea-water, which after being boiled down, deposits an unchrystallised brine, that consists chiefly of muriated magnesia, which when converted into sulphate of magnesia, by means of sulphuric acid, is sold in the shops, under the name of *bitter purging salt*. It is of considerable service as a purge.

EQUATION, in algebra, the mutual comparing two equal things of different denominations, or the expression denoting this equality; which is done by setting the one in opposition to the other, with the sign of equality (=) between them: thus 3*s*.=36*d*. or three feet=1 yard. Hence, if we put a for a foot, and b for a yard, we shall have the equation $3\ a=b$, in algebraical characters.

EQUATION *of Time*, in astronomy and chronology, the reduction of the apparent time or motion of the sun, to equable, mean, or true time. The difference between true and apparent time arises from two causes, the excentricity of the earth's orbit, and the obliquity of the ecliptic.

EQUATOR, in geography, a great circle of the terrestrial globe, equidistant from its poles, and dividing it into two equal hemispheres; one north, and the other south. It is in degrees of the equator, that the longitude of places are reckoned: and as the natural day is measured by one revolution of the equator, it follows that one hour answers to $\frac{360}{24}=15$ degrees: hence, one degree of the equator will contain four minutes of time; fifteen minutes of a degree will make a minute of an hour; and consequently, four seconds answer to one minute of a degree.

EQUILIBRIUM, in mechanics, is when the two ends of a lever or balance hang so exactly even and level, that neither doth ascend or descend, but keep in a position parallel to the horizon, which is occasioned by their being both charged with an equal weight.

EQUINOX, the time when the sun enters either of the equinoxial points, where the ecliptic intersects the equinoxial. It is so called, because when the sun is in these points, the days and nights are of an equal length all the world over. As the sun is in one of them, in the spring, viz. March 20th, it is called the vernal equinox; and in the other, in autumn, viz. September 23d, it is called the autumnal equinox.

EQUINOXIAL, in astronomy, a great circle of the celestial globe, whose poles are the poles of the world. It is so called, because whenever the sun comes to this circle, the days and nights are equal all over the globe; being the same with that which the sun seems to describe, at the time of the two equinoxes of spring and autumn.

ERINACEOUS, *Europæus*, the common hedge-hog, is found in all the temperate climates of Europe and Asia. Its whole length is about eleven inches, its colour generally a grey brown. It lives in hedges and thickets, and subsists on young toads, worms, beetles, crabs, fruits, and birds. It conceals itself in its hole during the day, and by night wanders in search of food. It builds its nest of moss, and produces four or five young ones at a birth. These animals possess the curious, though not completely singular, property of rolling themselves into a compact form, like a ball, their spines only appearing, and presenting to the enemy an armed front, which he generally trembles to assail. The greater the danger it is exposed to, the more closely it is compacted, and it is difficult to compel it from this state to its usual form without the application of cold water, on being immersed in which it appears in its usual shape. It lies in this ball-like form during the winter in its mossy nest, insensible to the extremity of the cold, and, on the approach of spring, resumes its nocturnal researches. It is perfectly harmless, and in some countries is said to be domesticated, and in this state is employed by the Calmucks in their habitations to clear them from various annoying insects.

ERMINE, is a species of weasel, of white colour, except the tip of the tail, which is black. This is, however, only the winter colour of the animal in the northern part of Europe: in the summer it becomes brown instead of white, and in this state has the name of *stoat*.

This animal, which in its brown state is well known in all parts of England, is usually about ten inches in length, exclusive of the tail.

It is a remarkable circumstance, and one that affords us a very pleasing proof of the wisdom of Providence, that at the commencement of winter these and other defenceless animals change their brown summer coat to one similar in colour to the snows of that inclement season. By such means they are able to elude the sight of many of their enemies, to the attacks of which they would otherwise be peculiarly exposed.

The skins of ermines are a valuable article of commerce in several parts of the world, and particularly betwixt the Russians and Chinese. In some countries, as in Norway, Lapland, and Finland, the animals are found in prodigious numbers. They are generally caught in traps, but are sometimes shot with blunt arrows. Their skins are employed for ornamenting robes of state, and in various parts of female dress, and for these purposes they have been used during many centuries past, as is evident from ancient paintings, sculpture, and other authorities. The black tips of the tails are considered peculiarly valuable.

In Russia ermines' skins of good quality are sold at the rate of about a shilling each. They are usually sewed in lengths of three Russian ells, and these parcels are estimated according to their quality, at from two to five guineas each. Many deceptions, however, have been practised respecting ermines' skins, which have tended to depreciate their value; the principal of these is to conceal and sew small bits of lead in the feet to increase their weight.

Ermines, like all other animals of the same tribe, are carnivorous and very destructive to such quadrupeds as they are able either openly to attack, or to seize by stratagem. They are chiefly found amongst woods, in hedge-banks, hollow trees, heaps of stones, and the banks of rivers.

ESCHALLOT, ECHALOTTE, or SHALLOT, *Allium Ascalonicum*, L. is a native of Palestine, whence it has been introduced into our kitchen gardens. It is raised from suckers, which are set about the end of February, in beds or furrows, at the distance of about three inches from each other. Towards the end of June, the stems are tied up; and, in the course of another month, the plants are pulled out of the earth; when they are exposed to the air to dry, and afterwards preserved in some dry airy place.

The roots of the eschallot are very pungent; have a strong but pleasing smell, and are preferred to onions, as ingredients in highly-flavoured soups and gravies. They are also pickled, in which state considerable quantities are consumed in the East Indies.

This plant, when mixed with vinegar, rice, and honey, is said to be serviceable against the bite of a mad dog;

we doubt, however, the efficacy and propriety of such an application. It is also recommended as an excellent cephalic, especially when inhaled through the nostrils; but its most beneficial properties are those of creating an appetite, and expelling foul air.

ESPALIERS, in horticulture, are rows of trees, planted in gardens or hedges, in such a manner as to inclose distinct lots of ground; hence they are trained up regularly to a lattice of wood-work, in a close hedge, for defending tender plants against the injuries of the wind and weather.

The trees chiefly planted for espaliers, are apples, pears, and plums. While they are young, it will be sufficient to drive a few stakes into the ground on both sides; the branches being fastened to them in a horizontal direction, as soon as they appear. At the expiration of three years, an espalier is to be made of ash-poles, of which two sizes, large and small ones, should be employed; the former are to be driven upright into the ground, about a foot distant; the latter or smaller poles, are to be nailed across these, at the distance of nine inches.

There is another kind of espaliers, made of square pieces of timber cut to any size; and which are certainly more handsome and regular, but on account of the extravagant price of wood, less economical than those constructed with ash-poles.

As soon as the espalier is thus framed, the branches are to be affixed to it by means of osier twigs; being trained in an horizontal direction and at equal distances. Fruit trees managed in this manner are preferable to all others, because they not only bear more delicious fruit, but also require less room in a garden; and consequently do not retard the growth of such plants as may be cultivated in their vicinity.

ESSENCE, or Essential Oil, as it is variously termed, in medicine, denotes the purest, most subtle, and balsamic part of a body, extracted by distillation.

There are a variety of essences drawn from flowers, fruits, &c. which are used on account of their agreeable flavour by apothecaries, perfumers, and others: the principal of these are the essence of rosemary, of turpentine, of anise, of cloves, of cinnamon, and of lemons.

The essences sold by perfumers, chiefly consist of the oil of bitter-almonds, to which they impart the odour of jessamine, roses, cinnamon, and other flowers and spices. When essential oils have been distilled, they should be suffered to subside for some days, in vessels loosely covered with paper, till they have lost their disagreeable, ardent odour, and have become limpid; they should be put into small bottles, which ought to be completely filled, closely stopped, and kept in a cool place: by observing these precautions, they will retain their virtue for several years. But, if essential oils be carelessly managed, they gradually lose their flavour and become thick: in this case, they should be put into a still, with fresh ingredients for distilling the same oil; by which means they will saturate themselves with the odoriferous particles, and regain their former strength and purity.

Essential oils, medicinally considered, agree in the general qualities of pungency and heat: with respect to their particular virtues, they vary as much as the vegetables from which they are extracted. Thus, the carminative properties of aromatic seeds, the diuretic effects of juniper-berries, the stomachic virtues of mint, and the antiscorbutic powers of scurvy-grass, are in a great measure concentrated in their oils.

These oils are never given in a pure state, on account of their extreme pungency, which in some is so great, that if a single drop be deposited on the tongue, it will occasion a gangrenous eschar, or scab. They are readily imbibed by pure, dry sugar, being the most convenient form in which they can be administered. The more mild and grateful oils are frequently used as ingredients with other medicines, to render them less nauseous. The more pungent ones are externally employed in paralytic complaints, numbness, colds, aches, and in other cases, where particular parts require to be heated or stimulated.

[**ETCHING**, is the art of producing an impression or copy of any picture, by eating away the copper on which the design is traced. A copper plate for instance is covered with a varnish of wax and asphaltum, while warm, and the design is then etched or traced with a sharp instrument, through the varnish, down to the copper, which being by this means left exposed, is covered with dilute aqua fortis, which dissolving the copper in those parts, produces an inequality of surface, in which the ink subsides, and, by pressure, communicates the impression to paper. This does not admit of strokes so fine as engraving with the sharp-pointed steel engraver, but is much more expeditious and cheaper.

Etching is performed, either on copper or on stone. As to the last see Lithography.

Mr. Frederick Accum has lately shewn, that the art of etching was known in Germany in the beginning of the last century; but it appears to have been forgotten, or lost. Scheele discovered the fluoric acid, and re-invented the art of etching on glass, in 1771.

Aqua Tinta, a mode of etching, wherein the ground appears in very minute chrystals, first brought into vogue in England, by Paul Sandby, and now much used, from its softness, almost equal to Indian ink drawings, is the following:

Dissolve rosin in spirit of wine: pour it on your plate, then pour it off again: as the spirit evaporates, the rosin chrystallises, leaving a ground to be eaten by aqua-fortis. For rosin, sandarac or mastic may be substituted.

Or, sift slightly some finely powdered rosin, through a small lawn sieve, upon the plate. Hold the plate over the hot charcoal, at such a distance as the bottom part of the rosin will just melt sufficiently to adhere to the plate, without one particle running into the other. If melted, the ground will be uniform, which is to be avoided; for interstices are to be left between the particles, whereon the aqua-fortis is to bite.

Particular directions, with some improvements in the process of etching in aqua tinta, are to be found in a paper by Mr. Hassel of Clement's Inn, in the 37th vol. of Tilloch's Philosophical Mag. p. 297.—T. C.]

The operations incidental to etching are these: 1. Varnishing the plate; 2. Tracing the design; 3. Etching; 4. Walling the plate; 5. Biting or corroding; 6. Cleansing the plate.

1. "Varnishing the plate." The plate being moderately heated, by exposing the unpolished side to the flame of a candle or to a fire, a piece of varnish, covered with fine and clean silk is to be passed over the opposite surface, leaving a thin coat melted on the plate. The plate is to be held with a hand-vice. The varnish being thus laid on, a ball of cotton, inclosed in silk, is made use of to daub the plate over, in such a manner that no part is left uncovered by the varnish, nor the coating of an unequal or improper depth. The varnish being thus smoothed on the plate, take a large wax candle, and having driven two nails into a wall, whereon to rest the plate, with the varnished side downward, apply the flame to the varnish, as close as may be without suffering the wick to touch it, and guide it under the whole, till it is of a fine shining black. The plate is then to be set upon its edge to cool, and particular caution observed lest any dust settle upon it while warm.

2. "Tracing the design." The outline of the subject being procured, by drawing or by tracing with oiled paper the paper containing the design in the former case, or a thin sheet of a similar size in the other, is covered, on the side to be laid next the plate, with red chalk. The chalk is to cover the whole; but care must be taken that none which will easily come off be left. The paper being laid on the plate, and fastened to its place, by means of white wax at the corners, the whole outline is to be traced with a needle. On removing the paper, the outline in chalk will be found on the varnish.

3. "Etching." The outline, thus obtained, is now to be traced with the needle on the copper, and the whole cleared by wiping the chalk away; which may be done with soft leather. The degree of finishing intended to be given by means of corrosion being completed, and every accidental scratch upon the varnish stopped up, the etching, properly so called, is finished.

4. "Walling the plate." A composition of wax prepared for the purpose, being made sufficiently warm for the requisite pliancy, is to be placed on all sides of the plate, in the manner of a wall, and fitted to contain a fluid on the surface.

5. "Biting or corroding." The nitrous spirit, attempered with water, is now to be poured on the plate. The varnish is impenetrable; and it corrodes only where the needle has been at work. Experience is here necessary: the liquor is not to be too weak; and if too powerful, it will not only give the etching a coarse appearance, but break up weak parts of the varnish, and in a violent and rapid manner destroy the whole.

If accidents of this nature occur, the aqua-fortis must be poured off, and the plate washed with pure water, and dried at the fire; after which, the parts improperly exposed to the corrosion are to be covered with a soft varnish, manageable by means of a hair-pencil. The same measures are also to be taken when the lighter parts of the work are supposed to be bit sufficiently deep.

When the aqua-fortis operates, the etching is covered with air bubbles, green with the copper they contain: these are to be removed in a gentle manner, by means of a feather, introduced into the liquor.

6. "Cleansing the plate." When the corrosion is finished, the plate must be washed and dried. The wall is then to be removed, and the varnish may be cleared away by heating the plate, adding oil, and wiping the whole with a woollen substance.

In this state, a proof is usually obtained from the printing-press; and if, as is commonly the case, the plate is to be finished with the graver, this is what now remains to be done.

"General observations." The plate, properly prepared, is to be procured from the copper-plate maker; the varnish, wax, and needles are to be had from the dealers in drawing materials.

The soft varnish, is the common varnish rendered somewhat liquid by means of turpentine: its consistence should not be thinner than is necessary for penciling.

The variation of tone, or of light and heavy strokes, so essential to the print, is not to depend wholly upon the greater or less degree or duration of corrosion to which they are exposed. Needles of various sizes, as they are kept in the shops, are to be employed.

There is another species of etching, at present much practised, by which the effect of drawings in chalk or pencil is represented. In this art, a crayon or pencil is used instead of a needle, and the reverse of the design need not be covered with chalk. The artist, having the varnished plate under his paper, proceeds as if he were simply drawing; and the pressure of the crayon or pencil is sufficient to cause the adhesion of the varnish to the paper, in such a manner as to leave an exact imitation of the design upon the copper, pierced through the varnish, and ready to receive the aqua-fortis. See Varnish.

ETHER, is a very subtle penetrating fluid, prepared by distilling equal proportions of rectified spirit of wine, and vitriolic acid.

[The ether in common use, is sulphuric ether, but it may be made with the nitric, the muriatic, or the acetic acid. The spirit of wine is decomposed by the action of the acid, which abstracts from it carbon and water, and renders it a much more pleasant, and aromatic liquor.

When the action of the acid on the spirit of wine is not carried to the extent necessary to form ether, the liquor that comes over is called dulcified spirit, in the apothecaries' shops.

Ether is used to give a violent and sudden stimulus to the stomach in cases of gout and hysterics. Sometimes it is of service in tooth-ach. Internally the dose is about a tea spoonful, which may be repeated if occasion requires.—T. C.]

This spirit is the lightest, most volatile, and most inflammable yet known; it floats on the surface of the most highly rectified spirit of wine, as oil floats on water: and, if it be dropped on a warm hand, it exhales immediately, diffusing a penetrating fragrance, and leaving no trace of any moisture.

ETHICS, the doctrine of manners, or science of moral philosophy.

EUDIOMETRY. The measurement of the quantity of oxygen contained in atmospheric air, or indeed in any gas in which it is not intimately combined, is named eudiometry, and the instrument by which it is performed, the eudiometer. To attain such a measurement, it is merely necessary to present to atmospheric air, some substance which combines with its oxygen, and which either does not afford any gaseous product, or affords one that is easily abstracted and measured. Different substances have been applied to this purpose. The fluid originally employed by Scheele, in the analysis of the air, the solution of sulphuret of potash, or what is rather more convenient, the sulphuret of lime, is perhaps superior in accuracy to any, at least if the air be not too long exposed to it, and be not in too small quantity proportioned to the quantity of fluid. The instruments for subjecting atmospheric air to such changes as may indicate its proportion of oxygen, have been called eudiometers. When a mixture of nitrous gas is to be made with atmospheric air, the most convenient apparatus consists in a glass tube closed at top, and graduated by a diamond into cubic inches and parts. The lower aperture may be widened, in order that the gases may more easily be passed up, and likewise to afford the facility of its standing alone upon the pneumatic shelf. It is likewise usual and advantageous to fit a stopper in the mouth by grinding; a cubic inch measure will be required for determining the quantities poured up. A bottle will do for this purpose, and the instrument may be made very well by a chemist who is obliged to work for himself; by taking any small bottle whatever, and pouring its contents of water, by successive times, into the tube placed mouth upwards. By this means he will obtain a graduation, which, whether of the cubic inch or not, will answer the purposes of eudiometry.

When air is to be exposed to a liquid sulphuret, which absorbs the oxygen, the eudiometric tube may be immersed in the liquid. It consists of a small bottle, of the contents of about three ounces, intended to contain the eudiometric liquid; into the neck a tub is accurately fitted by grinding, which holds precisely a cubic inch, and is divided into a hundred equal parts, and on one side the bottle, near its bottom, there is a neck into which a stopper is ground in the usual manner. In the use of this apparatus the bottle is first filled with the liquid employed, which is best prepared by boiling a mixture of quick lime and sulphur with water, filtering the solution, and agitating it for some time in a bottle half filled with common air. The tube, filled with the gas under examination, or with common air, if that be the subject of the experiment, is next put into its place, and, on inverting the instrument, the gas ascends into the bottle, where it is brought extensively into contact with the liquid, by brisk agitation. An absorption of oxygen, if present, ensues, and to supply its place, the stopper in the side of the bottle is opened under water, a quantity of which rushes into the bottle; the stopper is then replaced under water, the agitation renewed, and these operations are alternately performed, till no farther diminution takes place; the tube is then withdrawn, while the neck of the bottle is under water, and after the tube has been kept in this situation for a few minutes, the quantity of the diminution will be seen by the graduated scale upon the tube.

Tubes fitted up for exploding a mixture of hydrogen, or other inflammable gases, with oxygen gas, have been called the eudiometers of VOLTA; they are usually made very strong, and are provided with two wires, which pass through sockets cemented in holes drilled through the glass, near the top, which is not perforated. The electric spark being passed between these wires, gives fire to the gases, not without some risk of blowing out the confining liquid, or breaking the glass.

EUPHORBIA, *Ipecacuanha*, L. This plant is peculiar to light, dry, sandy soils, and grows abundantly in New-Jersey, and the maritime districts of the southern states It is a pretty plant, the stems rather procumbent and diffusive in their manner of growth, leaves remarkably variable in their figure, but generally oblong or broad lanceolate, whilst others are long and narrow, some almost liniar, like grass; but all are of a full, dark, crimson colour, except such as grow in shade, which are of a livid green, elegantly reticulated with crimson veins. In medicine it is a sure and powerful emetic, but perhaps too drastic, and ought to be administered with caution, and by such as have investigated its properties. It is an Indian medicine, yet commonly used by country people.

We have several other species of this genus, two of which are very handsome plants, viz. E. *Corollata*, E. *Picta*.

EVACUATION, in animal economy, is the act of diminishing, attenuating, or discharging the humours.

The due evacuations of the body, and its proper nourishment, are equally necessary; and it is an object of the utmost importance, that nothing remain in the constitution which should be discharged; and that whatever is conducive to its preservation, may not be uselessly wasted. If the evacuations be disordered, the most rigid adherence to dietetic rules will not contribute to the continuance, or restoration of health; these rules, however, may often be dispensed with, provided the evacuations be regular.

It is not only the noxious, or corrupt matter, which is removed by this process, but also the useful fluids, if they abound, such as the milk, blood, &c. to which subjects we refer, and likewise to the articles EAR, NOSE, URINE, &c.

EVAPORATION, is the conversion of fluids, chiefly of water, into vapour which is specifically lighter than the atmosphere.

There is no subject that has occasioned a greater variety of opinions than the theory of evaporation; but, consistently with our plan, we shall recite only a few established facts.

Evaporation is one of the great chemical processes, by means of which Nature supplies the whole vegetable kingdom with the dew and rain necessary for its support Hence, it takes place at all times, not only from the surface of the ocean, but also from that of the earth. Nor is it confined to these: it is even carried on from the leaves of trees, grass, &c. with which the earth is covered. Great part of the water which is thus raised, descends again during the night, in the form of dew, being absorbed by those vegetables which yielded it before.

One of the most beneficial effects of evaporation is, to cool the earth, and prevent it from being too much heated by the sun. This property of producing cold, by evaporation, has but lately been observed by chemists, who have accordingly availed themselves of it in its fullest extent; though their mode of procuring cold, by means of those expensive fluids, ether and spirit of wine, can only be employed by way of experiment. The most simple method, however, of producing cold by the evaporation of water, may be applied to various useful purposes, especially in warm countries: thus sailors are accustomed to cool their casks of liquors, by sprinkling them with sea-water. See also Ice.

Dr. Darwin justly observes, that the evaporation of moisture from the surface of the earth, produces so much cold as to injure those terrestrial plants which are too long covered with it. Hence such parts of wall-trees as are sheltered from the descending dews by a coping stone on the wall, are not so liable to be injured by frosty nights; because they are not made colder by the evaporation of the dew, and also have less water to be congealed in their vessels, and to burst them by its consequent expansion.

EVENING, is that part of the night which commences with sunset, and properly terminates when the prudent and industrious repair to their couch—long before midnight.

In countries surrounded by the ocean, the evenings are generally damp and chilly, so that the temperature of the air is many degrees colder than in the preceding day. Hence the necessity of adopting a warmer dress than usually worn, if we are obliged to expose ourselves to the evening air: invalids and convalescents ought not to leave their apartments after sunset, even though the sky be ever so serene, and the weather uncommonly mild.

> The dews of the evening most carefully shun,
> Those tears of the sky, for the loss of the sun.
> Lady M. W. Montague.

Nor is it proper for the healthy to pursue those occupations in the evening, which are attended with proportionally greater fatigue of mind or body: such pursuits ought to be followed in the morning, and the easiest purposely deferred to the latter part of the day; an arrangement by which a more composed and refreshing night's rest will be ensured. Beside this inconvenience, the eyes necessarily suffer from candle-light. See also Bed-time.

EVERGREENS, in gardening, are those perennial plants which continue their verdure, leaves, &c. throughout the year, such as bays, hollies, pines, firs, cedars of Lebanon, &c.

In the evergreen shrubs and trees of this climate, such as heath, rue, box, laurel, &c. the leaf does not die in the autumn, but continues to supply nourishment to the bud in its bosom during the fine days of winter, and in the spring, and survives till near midsummer, or till the new bud has expanded a leaf of its own. Hence Dr. Darwin supposes, that these evergreens lay up in summer no store of nutriment in their roots, or alburnum, for the sustenance of their ensuing vernal buds; and thus have probably no bleeding season, like deciduous trees.

Mr. Milne, in his *Botanical Dictionary*, under the article *Defoliatio*, observes, that "an evergreen tree, grafted on a deciduous one, determines the latter to retain its leaves. This observation is confirmed by repeated experiments, particularly by grafting the laurel (*Laurocerasus*) an evergreen, on the common cherry (*Cerasus*); or the *Ilex*, an ever-green oak, on the common oak." All these, adds Dr. Darwin, want further experiments, to authenticate the facts so delivered on the authority of ingenious men.

Evergreens are not only very great ornaments to a garden, at all seasons, but they also contribute to the purity of the air, when planted at a proper distance from dwelling-houses. Although their verdure, especially that of the pine and fir-trees, when scattered in rooms, exhales a narcotic and intoxicating effluvium, not unlike that of hops, yet the boughs of all evergreens may be usefully employed, particularly in winter, for correcting the stagnant air in a room: with this intention, the branches are plunged with their root-ends into vessels filled with fresh water, and exposed to the rays of the sun; but not suffered to remain in the apartment during the night, or in the shade.

EXCHANGE, in commerce, implies the receiving or paying of money in one country for a similar sum in another, by means of bills of exchange.—See **Bill of Exchange**.

The laws of all commercial nations have conferred great privileges on bills of exchange; punctuality in liquidating them is essential to commerce: as soon, therefore, as a merchant's accepted bill is protested, on account of his insolvency, he is considered a bankrupt.

A regular bill of this description is a mercantile contract, in which four persons are concerned, viz. 1. The drawer, who receives the value. 2. The drawee, his debtor, in a distant place, upon whom the bill is drawn, and who must accept and pay it. 3. The person who gives a valuable consideration for the bill, and to whom, or to whose order it is to be paid: and 4. The person to whom payment is to be made, and who is creditor to the third. By this operation, reciprocal debts, which are due in two distant places, are paid by a kind of transfer, or permutation of debtors and creditors.

Beside those merchants, who circulate among themselves their reciprocal debts and credits, arising from their importation and exportation of goods, there is another class of men who deal in exchange; that is, in the importation and exportation of money and bills. When, however, balances are to be made, exchange becomes intricate; and merchants, being engaged in their particular branches of trade, commonly intrust these complicated calculations to certain agents, who are therefore called *exchange brokers*, and have made this a most lucrative employment.

The Course of Exchange, is the current price between two places, which is always fluctuating and unsettled, being sometimes above, and at others below par, according to the circumstances of trade. When the course of exchange rises above par, the balance of trade is said to run against that country where it rises. But, though the course of exchange be in a perpetual fluctuation, and rise or fall, according to various circumstances, yet the exchanges of London, Hamburgh, Amsterdam, and Venice, regulate those of all the other trading places of Europe. Such readers as are desirous to make themselves acquainted with the laws of Great Britain, as they relate to cash bills, and bills of exchange, will find ample information in Mr. Chitty's "*Treatise on Bills of Exchange*," &c. where the subject is perspicuously and accurately treated.

Exchange, also signifies a building, or other place in considerable trading cities, wherein the merchants, agents, bankers, brokers, and other persons concerned in commerce, meet on certain days, and at certain times thereof, to confer and treat together of matters relating to exchanges, remittances, payments, adventures, assurances, freights, and other mercantile negotiations, both by sea and land.

EXCORIATION, or fretting of the skin, is a complaint sometimes arising from want of due attention to infants, or in persons unaccustomed to ride on horseback, or those who are unfortunately bed-ridden.

If the excoriation be only of a superficial kind, the application of a little flour, or covering the part affected with fine silken oil-cloth, will generally heal it in a few days: but, if these simple means do not succeed, Basilicon ointment, or Turner's cerate, have been found of service.

Excrescence. See **Wart**.

EXCRETION, in animal economy, is the discharge of noxious humours.

As the food and drink daily consumed must necessarily deposit feculent and useless matter, moderate evacuations by stool, are both necessary and beneficial, especially to those who are troubled with costiveness, head-achs, flatulency, spasms, and the numberless unpleasant disorders thence arising.—See **Costiveness**.

Persons in a good state of health ought to have one evacuation at least, in the twenty-four hours. Moderate exercise and a tranquil mind, equally tend to promote these salutary excretions, which should be in a state neither too fluid, nor too concrete. Hard and continued labour, ardent spirits, or heating liquors, as well as long abstinence, render them extremely tenacious in the strongest and most healthy individuals. When such a habit prevails, it at length generates costiveness, with all its attendant evils.

Those who indulge either in excessive eating or drinking, are generally troubled with loose and frequent stools; because their alimentary matter is expelled, without being properly assimilated. Indeed, thin and copious discharges are a certain evidence of indigestion.

Regular and daily evacuations, therefore, essentially contribute to the preservation of health. This desirable object may be attained, by taking sufficient, but moderate, exercise; by adapting the food to the nature of the constitution, and using a proportionate quantity of drink; by observing strict temperance in both; a due excretion of the noxious and superabundant fluids will be promoted, and health ensured.

EXECUTOR, in law, a person appointed by another's last will and testament, to have the execution of the same after his decease, and the disposing of the testator's goods and effects, according to the intent of the will. Where there is no executor, there is properly no will; and where there is no will, there can be no executors: but this only regards goods; for where lands in fee are devised, it is a good will, though no executors be named.

EXERCISE, in general, is such an agitation of the body, as produces salutary effects in the animal economy.

Exercise may be divided into two classes, *active* and *passive:* the former includes walking, hunting, dancing, running, leaping, swimming, riding on horseback, fencing, the military exercise, and, in short, all such games as require muscular exertions. Passive exercise comprehends riding in a coach, sailing, swinging, &c. all which we shall notice in their alphabetical order.

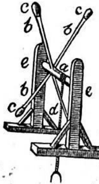
Exercise in the open air is, in every respect, preferable to that in houses, and close apartments. It ought, however, to be commenced and concluded in a gradual manner, and by no means abruptly. It should be continued only while we enjoy it without fatigue, and ought to be relinquished as soon as it becomes a task. The best time for this purpose is the forenoon, or some time before dinner, when the stomach is not too much distended: it increases the circulation, promotes a regular perspiration, and a due secretion of all the humours; strengthens the muscular parts, creates appetite, and aids digestion. Hence those who take proper daily exercise, are in general robust, and afflicted with few diseases comparatively.

On the other hand, violent exercise, or even fast walking, immediately before or after meals, impedes digestion. Immoderate exercise weakens the body, and, if continued, induces disease. Running footmen were never long lived.

We sincerely recommend the following rules of Dr. STRUVE to the serious consideration of those who are engaged in rearing children; being persuaded that, by timely attention to these circumstances, many accidents, and much deformity, may be effectually prevented.

1. Children ought to enjoy perfect liberty to move, leap, and take exercise at pleasure. 2. They should not be taught to rely on the assistance of others; but endeavour to make every effort consistent with their own strength. 3. When in the act of falling, they ought not to be seized by the arm; and, after a fall, should not be too much pitied. 4. Every kind of *spontaneous* exercise is preferable to that taken by *compulsion.* 5. Exercise, though at an early period of infancy, must be *uniform,* that is, not confined to particular limbs of the body, nor at any time carried to excess.

Many persons, being prevented from walking, riding, &c. in the open air, either by the inclemency of the weather, or from want of leisure, we have subjoined the following figure, representing a contrivance, that may serve as a substitute for dumb-bells.



The engine consists of a wooden cylinder *a,* which turns on two central pivots, *e, e,* inserted in the upright posts—*b, b,* are two rods, that may be made either of iron or of strong wood. These bars intersect each other at right angles, and are furnished with leaden weights at their extremities, *c, c, c;* which turn the cylinder with great velocity, when the rope *d,* attached to and passing round it, is pulled downwards. Farther, such weights draw the rope up again with considerable force, while it is wound backwards and forwards over the cylinder. As this machinery may be fixed in a garret, or other spare-room at the top of a house, the rope may be conducted through the ceiling into a lower chamber; so that sedentary persons, or invalids, may take sufficient exercise, without quitting their habitation, or exposing themselves to the vicissitudes of the weather. Dr. Franklin advises running up stairs repeatedly, as good in-door exercise.

EXHALATION, generally speaking, denotes effluvia or steams which arise from the surface of the earth, or other bodies, in the form of vapour.

Plants and flowers afford a grateful exhalation, provided their fragrance be not too strong: hence they should never be placed in confined apartments, as instances have occurred of persons being almost suffocated by sleeping in rooms where quantities of fresh flowers were exposed.

The exhalations arising from vast numbers of burning candles, as also from the breath of many persons respiring in the same room, are peculiarly unwholesome to weak and consumptive habits. This inconvenience may, however, be remedied by means of conical tubes, the funnels or broad ends of which should be placed so as to communicate in or above the windows, with the open air: thus, the latter will be impelled into the rooms with considerable force, and ventilate them more effectually, and at much less expense than is accomplished by fumigations, or other methods.

The vapour arising from charcoal is particularly hurtful; and, in close apartments, often productive of fatal accidents: the greatest precaution is therefore requisite, when charcoal is employed for culinary or domestic purposes. In a similar manner, *humid air* of every kind is very detrimental to health; and we seriously reprobate the keeping of damp linen, wet clothes, and even wet umbrellas in dwelling-rooms; as, by paying due attention to this circumstance, many serious accidents might easily be prevented.

EXOCOETUS, the flying fish, a genus of fishes of which there are three species: we shall particularly notice the Exocoetus exiliens or the Mediterranean flying-fish. This is about fourteen inches in length, and is found principally in the Mediterranean and Atlantic seas, frequently alone, and sometimes in small companies. By the extraordinary length of its pectoral fins it is enabled to quit the water and support a flight, about three feet above the surface, for the distance of eighty or a hundred yards, after which it is obliged to return to the water and moisten its fins, which even in this short progress, become hard and dry. These fishes are persecuted by the dorado under the water, and by the gull, or albatross, above the surface of it, and thus often escape destruction by the one only to incur it from the other. This faculty of maintaining short flights in the air is possessed by several other fishes, particularly by the scorpœna and the trigla.

EXOTIC, an appellation given to plants which are not natives of this country.

The generality of exotic plants do not thrive without particular care and culture; they require the warmth of their own climates: hence hot-beds, green-houses, &c. become necessary.—See Green-house, and Stove.

The best method of packing exotic plants for a voyage, especially if they be such as will perish above ground, is to set their roots as closely as possible in wooden boxes, filled with proper soil, and provided with handles: this operation may be performed three weeks before they are shipped. During fair weather, they should be exposed upon the deck, but in wet or unfavourable seasons, they ought to be removed, or covered with a tarpaulin.

If exotics are conveyed to a colder climate, they require very little moisture; but, if they are sent from a cold to a warmer country, it will be necessary to water them liberally; and, if they be sheltered from the scorching rays of the sun, they will safely arrive at the place of their destination.

There are, however, several plants that will live for a considerable time without earth, such as the Eschallot (to which we refer), and other *succulent* exotics. These vegetables require only to be carefully packed in boxes, with some moss: a little hay should likewise be added, to prevent the different roots from rubbing against or bruſing each other; the boxes should also be perforated with holes, an expedient by which the plants will be preserved from heating, and consequent putrefaction. With these precautions, they will not be materially injured by a voyage of two or three, or even four or five months. Several trees will likewise arrive in safety, if packed up in this manner, *after* they have ceased to grow; such as oranges, olives, capers, and pomegranate trees, of which great numbers are annually imported from Italy: and, though they are generally three or four months in their passage, yet they seldom receive any damage.

EXPANSION, in natural philosophy,

the enlargement or increase of bulk in bodies, chiefly by means of heat. This is one of the most general effects of caloric, being common to all bodies whatever, whether solid or fluid, or in an aëriform state. In some cases bodies seem to expand as they grow cold, as water in the act of freezing; this however, is known to be no exception to the general rule, but is owing to the arrangement of the particles, or to crystallisation, and is not a regular and gradual expansion like that of metals, or other solid substances, by means of heat. In various metals likewise an expansion takes place in passing from a fluid to a solid state, which is accounted for in the same way. The expansion of solids is exhibited by the PYROMETER (which see); a rod of iron, for instance, becomes sensibly longer and larger in all its dimensions in passing from a low to a high state of temperature. The expansion of fluids is shewn by the thermometer, and is the principle upon which that useful instrument is constructed; by immersing a thermometer into hot water, the mercury, or other fluid, contained in it immediately expands. See THERMOMETER. The degree of expansion produced in different liquids, varies very considerably. In general the denser the fluid, the less the expansion; water expands more than mercury; and alcohol, which is lighter than water, expands more than water. The expansion of aëriform fluids may be exhibited by bringing a bladder, partly filled with air, and the neck closely tied, near the fire; the bladder will soon be distended, and will, if the heat be strong enough, burst. Metals expand in the following order, those that expand most are placed first: zinc, lead, tin, copper, bismuth, iron, platina.

EXPECTORANTS, are such medicines as promote expectoration, that is, the discharge of mucus, or other matters from the breast, lungs, and windpipe, by coughing, bringing up phlegm, &c.

Expectorants operate in different ways; for, if the humour secreted, be acrid and thin, and the pores of the glands be too much constricted, these medicines generally relax, soften and widen the passages; diminish the acrimony of the animal fluids; and coagulate those parts which are too thin and watery: for which purpose, the liquorice-root, honey, spermaceti, saffron, mallows, and oil of almonds, are very frequently used. But, if a considerable quantity of thick, viscid matter be lodged in the lungs, so as to obstruct breathing, it will be necessary to aid expectoration by other means. This object may be effected by taking preparations of squills or gentle emetics.

EXPLOSION, in natural philosophy, a sudden and violent expansion of an aërial, or other elastic fluid, by which it instantly throws off any obstacle that happens to be in the way, sometimes with incredible force, and in such a manner as to produce the most astonishing effects. It differs from expansion in this, that the latter is a gradual and continued power, acting uniformly for some time, whereas, the former is always sudden, and only of momentary duration. The expansions of solid bodies, do not terminate in violent explosions, on account of their slowness, and the small space through which the metal, or other expanding substance moves. Thus wedges of dry wood driven into stone, and wetted, will cleave the most solid blocks, but they never throw the parts to any distance, as is the case with gunpowder; but the expansion of elastic fluids will burst solid substances, and throw the fragments a great way off: for this two reasons have been assigned: 1. The immense velocity with which aërial fluids expand, when suddenly affected with high degrees of heat: and 2. The great celerity with which they acquire heat, and are affected by it. As an example, air when heated as much as iron, when brought to a white heat, is expanded to four times its bulk, but the metal itself will not be expanded the 500th part of the space. In the case of gunpowder, which is well known as an explosive substance, the velocity with which the flame moves, is estimated at 7000 feet in a second. Hence the impulse of the fluid is inconceivably great, and the obstacles on which it strikes are hurried off with vast velocity, viz. at the rate of 27 miles per minute. The velocity of the bullet is also promoted by the sudden propagation of the heat through the whole body of air, as soon as it is extricated from the materials of which the gunpowder is made, so that it strikes at once. Hence it has been inferred, that explosion depends first on the quantity of elastic fluid to be expanded: secondly, on the velocity it acquires by a certain degree of heat; and thirdly, on the celerity with which the degree of heat affects the whole expansile fluid.

EXTRACTS, are those medicinal

preparations obtained by boiling vegetable substances in water, and gently evaporating the strained decoction in shallow vessels, to a thick consistence. Thus the most active parts of the plants are separated from the useless insoluble earthy matter.

EXTRAVASATION arises from the bursting or breaking of one or more of the blood vessels, after contusions, fractures, and other injuries of the head, as well as other parts of the body; this accident is sometimes attended with a copious discharge of blood, violent pain, and death itself, unless the patient be timely relieved.

As soon as the seat of the injury is discovered, the extravasated blood should fisrt be discharged; after which the wound is to be cleansed, and all splinters or foreign bodies extracted. The assistance of a surgeon is required, because a vein must be opened, and as much blood taken away as the case may require. A brisk laxative is to be given, and no animal food, or stimulating liquors should be used, and every degree of mental and bodily irritation should be carefully avoided.

EYE, the organ of sight, by means of which visible objects are represented to the mind.

It would be deviating from our plan, to give a minute anatomical description of this most useful organ; [nor shall we prescribe for the diseases of the eye, because surgical knowledge ought to be called in.—T. C.]

[Weak eyes are occasioned by, 1. Reading too much at night. 2. Too much repletion. 3. Too much drinking of stimulating liquors. 4. Too frequent use of magnifying glasses. 5. Strong sunshine, or snow. 6. Too much venereal indulgence. 7. Looking too much at the fire. 8. The heat of the fire; which two last, are very frequent causes of weak sight. Hence a stove room is in this respect preferable to a room with open fire places.—T. C.]

Those adults who are afflicted with weak eyes, should always burn two candles, placed in such a direction that their flame be neither too high nor too low; or rather make use of proper lamps.

Few remedies for preserving the eyes are more refreshing and invigorating, than bathing them in cold water, three or four times in the day.

In common inflammations of the eyes, a very cheap and efficacious remedy is a solution of ten grains of *sugar of lead*, in half a pint of rain, river, or snow water, premising one or two purges. Scarifying the whites of the eyes with the point of a sharp lancet, (a simple operation), affords immediate relief. Leeches are also highly useful in this complaint. Eyes naturally weak may be strengthened, by frequently washing them with green tea; to a cupful of which, add a tea spoonful of brandy: and by wearing a white hat, with black underneath, in summer.

F.

F, the sixth letter of the alphabet, is, by some, reckoned a mute, by others a semi-vowel. It has nearly the same sound as the Greek φ, or *ph* in English words, and is only written in words of Latin origin, *ph* being used instead of it in those derived from the Greek. F, as a numeral denotes 40, and with a dash over it thus $\bar{F}$ 40,000.

FACE, generally signifies the visage of any animal: it is more particularly applied to the human countenance; being the only conspicuous part of the body.

The bones of the face are divided into those of the upper and under jaw: the upper consists of thirteen bones, and the under is formed of one bone. The muscles of the face are those of the eye-lid, eye-ball, nose, mouth and lips. The human face is called the image of the soul, as being the seat of the principal organs of sense; and the place whence the ideas, emotions, &c. of the soul are chiefly set to view. Pride and disdain are shown in the eye-brows; modesty on the cheeks, majesty in the forehead, &c. It is the face shews the sex, age, temperament, health, disease, &c. The face, considered as the index of the passions, habits, &c. of the person, makes the subject of physiognomy. Face, among painters and artists, is used to denote a certain dimension of the human body, adapted for determining the proportion which the several parts should bear to one another: thus, the different parts of the body are said to consist in length, of so many faces.

The human face has always been considered the most comely and expressive part of the frame, so that various lotions, powders, &c. have been invented for beautifying and restoring ugly or decayed countenances. [But of all cosmetics the best are, good humour, soap, and cold water —T. C.]

FACE-ACH, or *Tic Douloureux*, is an acute pain in the face, which is sometimes accompanied by suppurating tumours: it mostly attacks persons of delicate habits, and those who are uncommonly susceptible of cold.

[To remove this distressing affection, it is best to apply at once to surgical advice. The only known remedies, as yet, are, opium and dividing the nerve. —T. C.]

FACULTY, in the schools, a term applied to the different members of an university, divided according to the arts and sciences taught there; thus, in most universities, there are four faculties: 1. of arts, which include humanity and philosophy; 2. of theology; 3. of physic; and, 4. of civil law. The degrees in the several faculties of our universities are those of bachelor, master, and doctor.

FÆCULA, in chemistry, the substance obtained by grinding certain vegetables or grain in water, and the fæcula is that part which, after standing some time, falls to the bottom. Starch is made from the fæcula of wheat.

FAGUS, in botany, the beech-tree, a genus of the monœcia order of the polyandria class. It contains three species; of which the beech-tree rises to the height of sixty or seventy feet, and in stateliness, and grandeur of outline, vies with the oak. Its leaves are oval and serrated; its flowers are produced in globular catkins, and succeeded by angular fruit, called *mast.* Its bark has a peculiar silvery appearance, which, added to the gracefulness of its port, and the elegance of its foliage, renders the whole tree among the first in beauty. Its wood is much employed in turnery, and in cabinet-making, particularly in the construction of chairs. The mast yields a good oil for lamps, and is a favourite food with mice, squirrels, and swine.

The chesnut-tree, another species, is capable of growing to a vast size. There is one upon Mount Ætna, called "*The chesnut-tree for a hundred horses.*" Mr.

Howel, who went from Aci to examine it, describes the circumference of its trunk to be one hundred and sixty feet. It is quite hollow, but this does not affect its verdure; for the chesnut, like the willow, depends upon its bark for subsistence, and, as it becomes aged, loses its internal part. Within the cavity, a house has been built, the inhabitants of which have an oven for drying nuts, almonds, and chesnuts, of which they make conserves; and, what the traveller justly laments, they frequently supply themselves with fuel from the tree under which they live. It has its name from a tradition that Jane of Arragon, spending some time in Sicily, on her way from Spain to Naples, visited the mountain, and a storm happening, took shelter, with her train, under this tree, the branches of which were sufficiently extensive to cover all. All that side of the mountain abounds with chesnut-trees. In Great Britain, at Tortworth, in Gloucestershire, is a chesnut-tree fifty-two feet round: it is known to have stood there ever since the year 1150, when it was called the Great Chesnut of Tortworth; and is supposed to be nearly a thousand years of age. The wood of the chesnut-tree, as a substitute for oak, is preferable to elm. It was formerly much used in London for the purposes of building; but it is not to be depended upon on these occasions. It is allowed to be excellent for liquor-casks, and recommended as an underwood for hop poles and stakes. Its fruit is valuable for swine and deer; and, when the growth of warm climates, as food for man: it is said to have been made into bread.

FAINTING. Nothing alarms bystanders so much as seeing a person faint away. This fainting arises from fright, loss of blood, or pains, and however unpleasant it is, is rather an antidote or a cure, than a disease; for, under fainting, there is a suspension of every faculty; during it the bleeding ceases, the pain is not felt, or the object that caused the fright is forgotten or removed. It is very seldom dangerous; and more harm has arisen from the improper modes adopted to remove it, than from the fainting itself. Let the person be laid in a horizontal position, and pressure of every sort removed, such as stays, neckcloth, &c.: if a man, let the shirt collar be unbuttoned, and nothing tight remain about the knees or arms. Stimulants are generally applied to the nose; and fortunately do no harm, because the person is insensible to their influence. If in a room, let the window be opened to cool the surrounding air, for if it be heated, even that stimulus is too great; for the same reason, it is improper for persons to stand in a crowd around one who has fainted, and who wants all the fresh and cool air that can be admitted to him. Never shake the body with a view to raise the vital spark, lest you darken it for ever.

Many persons from extreme sensibility, are apt to faint when they see any one in distress, or witness any alarming accidents: and hence, instead of being of any use, they add to the general confusion. This state of mind, as it is much to be lamented, so it ought to be guarded against with the utmost care. It depends, in some measure, no doubt, upon bodily constitution: but since we know it may be increased by indulgence, why should it not be checked, or perhaps cured, by good sense and resolution? it will be worth while to try; and for the encouragement of my readers, I can assure them, that many persons, who were formerly so timid as to run away from the sight of a little blood, and be amazingly alarmed at a shriek, have so far overcome this weakness, as to render themselves highly useful on many similar occasions. It is certainly right to sympathise with our fellow creature in their distress; but that degree of sympathy is best which, while it teaches us to pity, prompts us to relieve and assist them.

FAIRY RINGS. The circles of dark-green grass frequently observed in old pastures, have long been known under the name of fairy rings, and have generally been supposed to be occasioned, in some way or other, by electricity. Dr. Wollaston has, in a late volume of the Transactions of the Royal Society, given a new and very ingenious theory, of which we shall present our readers with a brief account, premising that Mr. Davy, in the course of his lectures at the Royal Institution, had occasion to refer to the subject, and seemed to coincide in opinion with Dr. Wollaston. That which first attracted his notice was the position of certain fungi which are always found growing upon these circles, if examined in a proper season. The position of these fungi led him to imagine that the progressive increase from a central point was the probable mode of formation of the ring: hence he conjectured that the soil, which had once contributed to the support of the fungi, might be so exhausted of some peculiar pabulum necessary for their production as to be rendered incapable of producing a second crop. The second year's crop would, if this theory be just, appear in a small ring surrounding the original centre of vegetation, and at every succeeding year the defect of nutriment on one side would necessarily cause the new roots to extend themselves solely in the opposite direction, and would occasion the circle of fungi continually to proceed, by an annual enlargement, from the centre outwards. An appearance of luxuriance of the grass would follow as a natural consequence, as the soil of an interior circle would always be enriched by the decayed roots of fungi of the year's growth. This theory is supported by some observations of Dr. Withering; and Dr. Wollaston says, by way of confirmation, that whenever two adjacent circles are found to interfere, they not only do not cross each other, but both circles are invariably obliterated between the points of contact: the exhaustion occasioned by each obstructs the progress of the other, and both are starved.

FALCO, in ornithology, a genus of birds, of the order of the accipitres, with three toes always before and only one behind. This genus comprehends the falcon-kind, properly so called: the hawk, gyrfalcon, eagle, buzzard, kite, and others, to the number of about 136. They, for the most part, are rapacious tribes, and feed on putrified carcasses; yet seldom, and never but when pressed by extreme hunger, attack living animals. They are bold and fly with great speed when high in the air, but slowly in its lower regions: have an exquisite sense of smell, and are very quick-sighted, not gregarious, generally build in clefts of impending rocks, their nests, which are called eyries, a term, however, which merely implies a place of eggs, but a few of them make their nests on the ground.

Falco, chrysaëtos, golden eagle, inhabits Europe and Siberia; flies to a vast height in serene weather, and descends against a storm. The general weight is about twelve pounds. There are two instances in Scotland of this bird having flown away with infants to its nest, yet in both the theft was discovered time enough to extricate them without essential damage. Eagles are very long-lived, many instances occurring of their existing upwards of a century, whence probably the allusion of the Psalmist, "Thy youth is renewed like the eagle's." They are capable of enduring abstinence; instances having occurred of the eagle's continuing for upwards of twenty days without food of any kind.

FALLING-STAR, in meteorology, a phenomenon that is frequently seen, and which has been usually supposed to depend on the electric fluid. Mr. Davy, in a lecture delivered at the Royal Institution, gave many reasons against this opinion: he conceives that they are rather to be attributed to falling stones. It is observable that when their appearance is frequent they have all the same direction; and it has been remarked that they are the forerunners of a westerly wind in England.

FALLOWING, in agriculture, is the mode of preparing land, by ploughing it a considerable time before it is ploughed for seed.

Lands are laid fallow either during the summer, or during the winter, according to the nature of the soil, and the judgment of the cultivator. [But as there is only one good reason for fallowing, namely, to destroy weeds, and as this can be done full as well by fallow crops, that is, by crops that require frequent hoeing or cleaning during their growth, no fallows ought to be admitted in a good system of agriculture. In England they are nearly obsolete.—T. C.]

Dr. Darwin, when treating on this subject, justly observes, that, though a summer fallow my be of advantage to a poor soil, which has nothing to lose, yet it must be injurious to a rich one, which has nothing to gain.

FAN is an implement of husbandry, employed for winnowing corn.—See Winnow.

FARCY, a disorder almost peculiar to horses, but which sometimes also affects oxen, and other cattle.

The farcy is infectious, and spreads among horses, in a manner similar to the distemper.

This malady is generally occasioned by sudden changes of excessive heat and cold; it may also take place when the animal is galled by rusty spurs, snuffle-bits, &c. or after being bitten by an infected horse.

The farcy is a disease of the lymphatic system. It is commonly, but erroneously, supposed to be a disease of the blood vessels. The corded tumors which appear, are called *buds*, and generally are on the inside of the thigh, neck, and shoulders—They are very painful at first, but nearly insensible after they have suppurated. On opening them, an ulcer, very difficult to heal, is formed.

The causes are principally putrid matter, coming in contact with the skin, changes from heat to cold, or the contrary, want of exercise, and of cleanliness. To cure the disease, blood must be taken away, smart purges of aloes and calomel, mixed with honey or molasses, given, and 1 oz. of mercurial ointment, joined with camphor, rubbed every day below the tumors, until the salivation is produced. Applications of sal-ammoniac dissolved in water, or vinegar, (one oz. to a pint of water) will also be highly useful. By the above treatment, the editor, Dr. MEASE, had the satisfaction to cure a very fine horse belonging to a friend, which had been given up as lost.

If the tumors cannot be dispersed, they may be opened with a lancet, after being fully maturated, and then dressed with bees-wax and oil. Proud flesh must be kept down by red precipitate; and powdered antimony freely given. If the horse become emaciated, the diet should be generous; but if in high flesh, the allowance should be short.

The common practice of firing these tumors, is highly cruel and absurd. There can be no reason, why lymphatic swellings should be treated differently, when they occur in horses and in human creatures; in the latter case, firing would not be thought of.

FARINA. See FLOUR.

FARINA FÆCUNDANS, the impregnating meal or dust on the apices or antheræ of flowers, which being received into the pistil or seed-vessel of plants, fecundates the rudiments of the seeds in the ovary, which otherwise would decay and come to nothing. The manner of obtaining the farina of plants for microscopical observation is this; gather the flowers in the midst of a dry sun-shiny day, when the dew is perfectly off, then gently shake off the farina, or lightly brush it off with a soft hair-pencil, upon a piece of white paper; then take a single talc of isinglass between the nippers, and, breathing on it, apply it instantly to the farina, and the moisture of the breath will make that light powder stick to it. If too great a quantity is found adhering to the talc, blow a little of it off; and if there is too little, breathe upon it again, and take up more. When this is done, put the talc into the hole of a slider, and applying it to the microscope, see whether the little grains are laid as you desire, and if they are, cover them up with another talc, and fix the ring, but care must be taken that the talcs do not press upon the farina in such a manner as to alter the form.

FARM-YARD. To give the plan of a complete farm-yard, is not to be expected. Farmers differ so much in their situations, pursuits, resources as to capital, and in their opinions of the necessary arrangements, that it is next to impossible to lay down the plan of one that would be deemed perfect. All that can be done in a work like the present, is to give the general outlines, with proper references to works in which various plans may be seen.

1st. A farm-yard should be well supplied with water and troughs for watering the cattle.

2. The whole yard and its buildings should be in view from the mansion, and at a proper distance therefrom.

3. The food kept near the housed live-stock.

4. The yard compact, and the doors of the buildings, and the gates of the yard seen from the mansion

5. The yard containing cattle to be housed, is never to be littered with straw, but all litter carelessly dropped on it, is to be raked off, for security against fire.

6. When the beasts are let out to be watered, they are instantly to be returned to their stalls, regularly in detachments.

7. The home-stead includes this yard; together with its stack-yard, the garden, orchard, and a few acres, for occasionally letting mares, or sick beasts run in, at liberty.

PIGEON-HOUSE. Pigeons feed expensively on corn alone, but they also feed on many wild seeds. They make an agreeable variety on the table, and form an important article in that œconomical dish, a pye. See article DIET.

For plans of farm-yards, the *Annals of Agriculture*, by A. YOUNG: the country reports drawn up for the *British Board of Agriculture;* and the works of Mr. MARSHALL, may be consulted.

The steady and attentive application of *manures*, is held to be an essential duty in farming, a great link of the chain, in every instance. If rich soils require, comparatively, but a moderate quantity, in a rotation where ameliorating crops are prevalent, yet middling and poor soils want all that can be obtained; and, under the *old Maryland courses especially*, all soils eagerly demand *more manure than can be readily* *procured.* These exhausting courses we see continually impoverish the soil. Too many farmers, therefore, incline to move to fresh lands; where they would precisely act the same murderous part over again.

The principal links in good farming, are, due tillage, proper rotations of crops, which are treated of above, and manures, of which it is wished the occasion would admit of more than the few observations which follow.

In the American practice, hay and fodder are stacked in the fields; and the cattle are fed round the stacks and fodder-houses: the disadvantages whereof are,

1. A wasteful use of the provender.
2. The *dung* lying *as it is dropt*, without *straw*, or other vegetable substance brought to it, the manure is little in quantity; and,
3. That little *not lying in heaps*, is reduced abundantly by *exhalation* and *rain;* without leaving any thing to the soil.

In the English and Flemish practice (feebly observed by a few of our husbandmen), *cattle* are carefully housed, or otherwise confined to a fold-yard, in which are *shelters* against cold rains, during the whole winter, and as far through the spring as food will last: the advantages of which, are,

1. A fair expenditure of the provender, *without waste.*
2. Less *exhaustion* of the juices; because of the dung lying together in large heaps.
3. The dung being mixed with the *straw*, and other vegetable substances brought to the beasts as litter, the whole is trod together, and forms a large quantity of very valuable manure.

It may be no exaggeration to affirm, that the *difference* in the quantities of manures obtained from an equal stock of cattle by those several methods, may be as three to one. If six acres may be annually manured by the inferior method, then may eighteen by the superior. Now, on a supposition, that manured land is kept in heart five years, without repeating, in the one case but thirty acres will always remain in good order: in the other, ninety acres: a very important difference. Indeed it is all the difference between an husbandman's poverty and his riches.

Do cattle, when foddered round haystacks and fodder-houses, or ricks, give twelve loads of manure each? Do they yield one such load? It is a fact stated, I think by Mr. Young, that, in the course of a winter, cattle kept up and littered *in a yard*, have yielded full twelve such loads each beast; and if soiled or fed well during the summer with cut green grass, or clover, they may be expected to yield more and richer manure; especially when they are kept up, on a full quantity of litter. Here, by the way, it may be noted, that a portion of grass only sufficient to keep one beast in pasturing, has sufficed five in soiling: and what is of immense importance to the state of the ground and of future crops, the ground being *untrod*, in soiling, is left light and mellow. Another favourable circumstance attends soiling: the beasts are kept in shade, and considerably protected from flies; especially when the house is kept dark during the heat of the day, with only air-holes near the ground and above their heads.

"It will be said the ground round the stacks receives the dung dropt, as a dressing to so much of the field: but we know this extends to a very small distance, and the effect is in no part considerable. The place chosen is some eminence; the rains and winds of half the year, wash away and evaporate, from the frozen ground, most of the rich substance of the dung so dropt about; and the ground whilst unfrozen, is trodden close, and poached to a degree that untills it nearly equal to the value of the dung left on it uninjured. This is illustrated: a fodder-house, (a hollow rick made of maize tops in the way of thatch), was set up in a field, as is usual; it was fenced in. At the south front, maize was husked, and the husks were sheltered in the fodder-house. In the course of the winter they were given out to cattle, in front of the rick. In April, the fodder-house being then empty, was pulled down, and the covering of maize tops was given to the cattle. The ground thus *sheltered* by the fodder-house for six months, October to April, shewed marks of richness greatly superior to the ground on which the cattle were foddering during the same time: grass weeds and crops, during the four or five following years of my remaining on the farm, shewed this in their great growth. Where the fodder-house, three hundred feet long and twenty broad, stood and sheltered the ground, the richness of the soil was strongly marked; when but a faint superiority over the common field appeared on the part where the cattle were foddered.

"*Litter* is an essential, to cattle, when let into *yards*, without which *yard manure* is of small account; and, unless it be in *full proportion* to the number of cattle in the *yard*, it is not thought highly of; but is as a half done thing. Good farmers in England deem *full* littering of cattle, when in *yards*, of such importance, that after reaping with sickles and inning their wheat, they cut the *stubble* and stack it for litter. Besides straw and stubble for litter, they apply to the same use, fern and such other vegetable substances as they can procure: and they buy straw from common farmers who are not in the practice of littering. In all countries, common farmers are indifferent to improvements: they look not beyond old habits; and it is prudent that they venture not on extensive new projects, without first making experiment. A full littering is three loads of 12 or 1300 lbs. of straw to each grown beast. Maize stalks may be carried from the field in great quantities, in a skeleton frame cart; if not cut up and fed when fresh, they are more nourishing, owing to the saccharine juice with which they abound." Mr. BORDLEY.

Many farmers feed in their yards in racks, and suppose that they gain every possible advantage from the practice, by the saving of the dung dropped, trampled and watered by the cattle; and though this practice is certainly preferable to wasteful pasturing, or to feeding in racks in the fields, yet it ought to be recollected, that the manure will be much inferior to that made and preserved under cover. For there are objections against the practice of yard feeding, viz. Danger from a vicious beast injuring another; the irritation arising from their contentions for food, and worrying by flies, all of which are avoided by feeding in stalls under cover.

Where cattle are yard fed, or stall fed in yards, under sheds; it is of great consequence to defend the beasts against the cold and damp N. E. winds, and the cold blasts from the N. West. Mr. E. DUFFIELD, therefore, advised a friend who wished to have a complete farm-yard, to erect a range of buildings in a S. E. direction, to have double stalls below, leaving the S. W. and S. E. sides open, to admit the sun in the winter, and give free entrance to the prevalent winds in the summer.

FARRIERY, the art of preventing, curing, or alleviating the disorders of horses.

[This is now a regular branch of study and of practice, attended to in Europe, in veterinary schools, and colleges, erected for the express purpose of teaching it.—T. C.]

FAT, an unctuous, solid substance, deposited in little membranous cells, in various parts of animal bodies.

The uses of fat are, 1. To serve as a kind of covering to the body, in order to preserve it from cold and other injuries. 2. To defend the more tender and sensible parts from being too strongly irritated by the salts. 3. To preserve in good order the pliancy of the muscles, of the skin, and of the other parts between and about which it is placed. 4 To facilitate the motions of certain parts; as the eyes and jaws. 5. To fill up empty intersticial spaces, and by that means to add to symmetry and beauty; as is evident in the face and the neck. 6. To prevent the painful pressure and attrition of the parts, particularly in the soles of the feet, the nate, and other like parts; in all which the fat is copiously disposed, and serves in the place of a cushion for the muscular flesh to rest upon. 7. There is great reason to suppose, that when the body does not receive nourishment in the usual way, the regress of the fat into the veins supplies that defect.

[The fat of animals used for food is wholesome when not burnt, or not rancid: in either of these cases, it produces indigestion and heart-burn. Fat is thrown away too often. In France, no body throws away dripping, because by means of crumbs of bread, or flour, it may be made miscible with water, and form a part of soups, and sauces.—T. C.]

FATA MORGANA, a very remarkable aërial phenomenon, which is sometimes observed from the harbour of Messina and adjacent places, at a certain height in the atmosphere. The name, which signifies the fairy MORGANA, is derived from an opinion of the superstitious Sicilians, that the whole spectacle is produced by fairies, or suchlike visionary invisible beings. The populace are delighted whenever it appears, and run about the streets shouting for joy, calling every body out to partake of the glorious sight. This singular meteor has been described by various authors; but the first who mentioned it with any degree of precision was Father ANGELUCCI, whose account is thus quoted by Mr. SWINBURNE in his tour through Sicily; "On the 15th of August, 1643, as I stood at my window, I was surprised with a most wonderful delectable vision; the sea that washes the Sicilian shore swelled up, and became for ten miles in length like a chain of dark mountains; while the waters near our Calabrian coast grew quite smooth, and in an instant appeared as one clear polished mirror reclining against the ridge. On this glass was depicted, in chiaro-obscuro, a string of several thousand of pilastres, all equal in altitude, distance, and degree of light and shade. In a moment they lost half their height, and bent into arcades, like Roman aqueducts. A long cornice was next formed on the top, and above it rose castles innumerable, all perfectly alike. These soon split into towers, which were shortly after lost in colonnades, then windows, and at last ended in pines, cypresses, and other trees, even and similar. This is the Fata Morgana, which for twenty-six years I had thought a mere fable."

FEATHER, in physiology, a general name for the covering of birds; it being common to all the animals of this class to have their whole body, or at least the greatest part of it, covered with feathers or plumage.

Feathers make a considerable article in commerce, particularly those of the ostrich, heron, swan, peacock, turkey, goose, and duck

They may be considered as of four kinds: 1. quills, or the feathers of the wings; 2 those which cover the body; 3. the down which grows close to the skin; and 4 the long ones of the tail.

Of the first description, the goose, the turkey, and the crow, supply those usually employed in writing. The feathers of the common poultry are used for beds; and the down of the swan is sometimes made into muffs and other articles of dress. The eider-duck, the down of which is celebrated, is a native of the high northern latitudes: a considerable number breed in the west of Scotland, and supply the inhabitants with a profitable branch of trade; but the larger part of the down used in Great Britain is brought from Denmark.

The feathers chiefly used are those of geese, from which animals they are plucked three, four, and even five times in the course of one year: thus, in cold seasons many of these birds fall victims to that barbarous custom.

The best method of curing feathers is to expose them to the sun in a room; or, to the moderate heat of a common oven; and as soon as they are thoroughly dry, to put them loosely in bags, in which they should be well beaten, in order to cleanse them from all dust and filth.

Feathers are chiefly used for the stuffing of beds, which are certainly less wholesome than wool or horse-hair mattresses, and tend geatly to relax and enervate the human body. They have lately been manufactured into hats; a mode of employing them far preferable to that we have just mentioned.

Useful hints relative to bed-clothes, mattresses, cushions, &c. The purity of feathers and wool employed for mattresses and cushions ought to be considered as the first object of salubrity. Animal emanations may, under many circumstances, be prejudicial to the health, but the danger is still greater when the wool is impregnated with sweat, and the excrementitious parts of persons who have experienced putrid and contagious diseases. Bed-clothes and the wool of mattresses, therefore, cannot be too often beat, carded, cleaned and washed. This is a caution which cannot be too often recommended.

FEBRUARY, in chronology, the second month of the year, reckoning from January, first added to the calendar of ROMULUS by NUMA POMPILIUS. February derived its name from Februa, a feast held by the Romans in this month, in behalf of the manes of the deceased, at which ceremony sacrifices were performed, and the last offices were paid to the shade of the defunct. This month in a common year consists only of twenty-eight days, but in the bissextile year it has twenty-nine, on account of the intercalary day added that year.

FEELING, one of the five external senses, by which we obtain the ideas of solid, hard, soft, rough, hot, cold, wet, dry, and other tangible qualities. This sense is the coarsest, but at the same time the surest of all others: it is besides the most universal. We see and hear with small portions of our body; but we feel with all. Nature has bestowed that general sensation wherever there are nerves, and they are every where, where there is life. Were it otherwise, the parts divested of it might be destroyed without our knowledge. It seems that upon this account nature has provided, that the sensation should not require a particular organisation. The structure of the nervous papillæ is not absolutely necessary to it. The lips of a fresh wound, the periosteum, and the tendons, when uncovered, are extremely sensible without them. These nervous extremities serve only to the perfection of feeling, and to diversify sensation.

Feeling is the basis of all other sensations. All the nervous solids, while animated by their fluids, have this general sensation; but the papillæ in the skin, those of the fingers in particular, have it in a more exquisite degree, so perfectly, that they convey some notice of the figure of the bodies which they touch. The object of feeling is every body that has consistency or solidity enough to move the surface of our skin. It was necessary to perfect feeling, that the nerves should form small eminences, because they are more easily moved by the impression of bodies, than an uniform surface. It is by means of this structure that we are enabled to distinguish not only the size and figure of bodies, their hardness and softness, but also their heat and cold. Feeling is so useful a sensation, that it supplies the office of the eyes, and in some sense indemnifies their loss.

FELIS, in natural history, a genus of the order feræ. This tribe is temperate in its habits; climbs trees; sees best by night, and when falling from a height lights on the feet: waves the tail when in sight of prey, refuses vegetable food except from necessity: it includes the lion, tyger, cat, panther, &c. The lion inhabits Africa: more rarely the deserts of Persia, India, Japan. It preys on horses and other larger quadrupeds, and when pressed by severe hunger, on man; afraid of flame; restrained by dogs; when young is easily tamed: roars terribly; sleeps in the sun; eats every day; lazy, slow; leaps upon its prey; breath fetid; smell weak. Its flesh is eaten by the Africans. The strength of the lion is prodigious; he is able to break the back of a horse by a single stroke of his paw; to carry off with ease, a middle-sized ox or a buffalo; and to break the bones with his teeth with perfect ease, and swallow them with the flesh. His duration is uncertain. Buffon calculates it under thirty years; but in the tower of London, lions have lived, in a state of confinement, for sixty or seventy years. The Felis Tigris or Tyger inhabits the warmer parts of Asia, as China, Japan, and India, lives in woods and thickets near rivers: it is cunning, cruel, strong, and of vast swiftness, infesting and even desolating the human race. When tamed from its birth, it will exercise his ferocity as soon as liberated: the male destroys his own progeny; will at all times attack the lion, and is the most beautiful of all wild beasts

FELO-DE-SE, in law, a person that deliberately lays violent hands on himself, and is the occasion of his untimely death, whether by hanging, drowning, stabbing, shooting, or any other way. This is a species of felony, of which infants, idiots, lunatics, and persons distracted by a disease, cannot be guilty, it being the wilful and deliberate perpetration of self-murder that constitutes this crime. In England the goods and chattels, both real and personal, of a *felo-de-se*, are forfeited to the king: however the jury frequently save the forfeiture, by finding their verdict lunacy; to which they are inclined on a favourable interpretation, that it is impossible for a person in his senses to do a thing so contrary to nature.

FELONY, in law a capital crime, next in degree to petit-treason, and committed with an evil intention. Felony is either by the common law, the civil law or by statute. Felony at common law, is either against the life of a person, as murder, manslaughter, felo-de-se, and se-defendendo; against his goods, as larceny, and robbery; against his habitation, as burglary, arson, and house-breaking; or, lastly, against public justice, by breach of prison, rescue, and escape, &c. Piracy, and robbery and murder on the sea, is felony both by the civil law, and by statute.

FELSPAR, Common, is a hard kind of stone which varies much in colour, being flesh red, bluish grey, yellowish white, milk white, or brownish yellow.

It is found in mass, disseminated or crystallised in four, six, and ten-sided prisms; will strike fire with steel, and is sometimes opaque and coloured, sometimes transparent and whitish.

The name of Felspar is derived from the German language, and signifies spar of the fields. It is a very common substance, and constitutes a principal part of many of the highest mountains of the world. When exposed to weather it gradually acquires an earthy appearance, and at length passes into porcelain clay.

Felspar is of great use in the manufacture of the finer kinds of earthenware. Of the two substances which chiefly compose the porcelain of China, one called *petunzé* is a whitish laminar kind of felspar, and the other, called *kaolin*, very nearly resembles the common species in its decomposed state. This mineral is used in the celebrated porcelain manufactured at Seves, near Paris, for the purpose of giving to it a white and transparent appearance. Previously to being used, it is pulverised, made into a paste, and suffered to dry. It is sometimes applied to the surface of ornamental vases in the form of enamel.

Labrador Felspar is a very beautiful stone of smoky grey colour intermingled with veins and shades of blue, green, and golden yellow, exhibiting a brilliant play of colours, according to the position with respect to the light in which the stone is held.

The original discovery of this very singular mineral was by the Moravian missionaries, on the island of St. Paul, near the coast of Labrador; but it has since been found in various parts of Norway and Siberia. The visitors of the late Leverian Museum will, no doubt, recollect a remarkably fine mass of Labrador felspar, the surface of which was polished, and exhibited some of the most splendid and beautiful colours that could be imagined. It was considered to have been the most capital specimen that was ever brought to England.

This mineral, on account of its hardness, its brilliancy, and its capability of receiving a high polish, is in considerable estimation among lapidaries for different kinds of ornamental work, particularly for the tops and bottoms of snuff-boxes, for broaches and necklaces.

Moonstone, or *Adularia*, is the purest kind of felspar that is known; and is considered to have the same relation to common felspar that rock crystal has to common quartz. Its colour is white, sometimes with a shade of yellow, red, or green.

Although these stones are procured from mount St. Gothard in Switzerland, the name of adularia has been improperly given to them, since they are not found in the valley of Adula, as is generally supposed, but on other parts of the mountain. The finest specimens are brought from Ceylon.

It is a characteristic of this gem to contain blueish white spots, which when held to the light present a pearly or silvery play of colour, not unlike that of the moon, whence it has obtained the name of moonstone; and those specimens are considered most valuable which, when cut in a very low oval, present the silvery spot in the centre of the stone. Compared with most other gems the moonstone is very soft, yet when set in rings or broaches it is sometimes very beautiful.

FELTING, the method of working up hair or wool into a species of cloth, independently of either spinning or weaving. A hatter separates the hairs from each other by striking the wool with the string of his bow, causing them to spring up in the air, which fall on the table in every direction, which is covered by the workman with cloth, pressing it with his hands, and moving the hairs backwards and forwards in different directions. In this manner the hairs are brought against each other, and their points of contact considerably multiplied, and the agitation gives each hair a progressive motion towards the root, in consequence of which the hairs become twisted together. As the mass becomes compact, the pressure should be increased, in order to keep up the progressive motion and twisting of the hairs, which is then performed with greater difficulty. The hair intended for the manufacturing of hats is always cut off with a sharp instrument, and not pulled out by the roots, because the bulb of the hair, which would come out with it in the latter case, would render the end which was fixed in the skin very obtuse, and nearly destroy its disposition to unite with the adjacent hairs. The hairs should not be straight like needles, for then there would be no compactness in the stuff. The fibres of wool having naturally a crooked form, that substance is well adapted to the operation of felting. The hair of beavers, rabbits, hares, &c. being straight, cannot be used in felting, till it has been prepared for the purpose. See Hat.

[The felting of woollen hats is greatly promoted (as is said), by the use of the nitrate of mercury.—T. C.]

FENCE, in rural economy, is a hedge, wall, ditch, bank, or other inclosure, made round gardens, woods, fields, &c.

Various kinds of *plants* have been recommended for constructing the common fences, of which we shall point out the prinncipal: 1. The White-Thorn is the most proper for fences, as it grows quickly, is very durable, and makes a very handsome appearance. It thrives on any soil, where a ditch and a new bank are prepared for its reception, unless the soil consist entirely of sand or gravel: it will nevertheless grow even in such situations, if the planting be succeeded by heavy rains. 2. Black-Thorn is another excellent shrub for a fence: it is, however, much inferior to the white-thorn, as its growth is not so certain; and, where it thrives, its roots spread, and are apt to *run in* too much upon the land. For dead hedges and mending open places, the bushes of this plant are superior even to the white-thorn; they are likewise less liable to be cropped by cattle. 3. FURZE, to which we refer. 4. To these may be added the HOLLY, which is indeed preferable to either of the plants above-mentioned; for, though its growth is slower, and more uncertain, yet where it succeeds, it amply compensates for the delay and expense incurred, by its thickness, height, and strength.

The last tree which we shall mention, is the HORN-BEAM. It is chiefly used in Germany for the purpose of fencing lands; and is propagated from sets or slips, which are planted on a parapet of earth, with a ditch on each side, in such a direction that every two plants may intersect each other. See HEDGES.

Quick fences often become open in many places, at bottom, notwithstanding the utmost attention, and more especially if neglected. The barberry shrub on the contrary, will make an impenetrable fence, and always close at the bottom, because it puts up numerous suckers from the roots which fill every vacancy. It may as easily be raised from the berries as quick, or hawthorn, and it grows faster. The suckers also will strike root easily, especially if planted early. These shrubs may be had at most nurseries. This is worth a thought from those who have new ground to inclose.

[Whatever tree or shrub be pitched upon for a fence (and the common locust is as good as any; or the common crab) at the end of the second year cut it down to within three inches of the ground, and keep it cut at the top moderately every year till the side growths furnish a good fence close to the ground. —T C.]

The daily growing scarcity of wood in the United States, renders the inclosure of a farm very expensive. It behoves the farmer, therefore, to adopt every means to preserve his fences. It is well known that the decay of posts almost universally commences at the surface of the ground, and proceeding gradually to the centre, eats through the post. To prevent this, many farmers are wisely in the practice of charring the post a few inches above and below this part. This practice is highly proper. Charcoal is known to be indestructible by the common causes of decay, by which wood is destroyed. It has been suggested also, by a writer in the *Philadelphia Magazine*, June, 1798, to char the ends of the posts, and even the whole fence; to place the broad part of the rail uppermost, and the angle downwards; to prevent the lodgment of rain.

The cedar rails brought to Philadelphia, generally come from the immense swamps of Delaware and New Jersey; and are made in so slight a manner, as greatly to diminish their natural tendency to durability. In a grazing farm, where cattle pasture at large, it is of the greatest consequences to have strong rails, in order to resist the violent attempts to level them, which are frequently made by unruly beasts. Mr. WM WEST, of Delaware county, therefore, who does every thing about his farm in the best manner, procured his rails from Jersey, eleven feet long, and had them split in the manner of square rails, strong and thick, in preference to broad-rail fashion. The mortices in his posts, are 2½ inches wide.

These directions are worth attention by the farmer, in whatever plenty he may have wood for fence, because the time which will be saved to him, by not being obliged to renew his fence every seven years, is a great object; but to persons living near the great towns, wood is a serious expense: and we ought to begin in time to plant *hedges*, to inclose our grounds. The most proper mode of planting these shall be fully disclosed under the article HEDGE. See also INCLOSURE.

FENNEL, the COMMON, or Fennel Dill, *Anethum fœniculum*, L. a native perennial plant growing on chalk cliffs, and common on the western coasts. Its yellow flowers appear in July or August.

The tender buds of this aromatic plant are useful in salads; its leaves are boiled and used in sauces for several kinds of fish, and also eaten raw with pickled salmon, &c. The seeds yield an excellent aromatic oil, which is carminative, resolvent, and diuretic, without heating the body: on account of these valuable properties, as well as for its strong, pulpy, and esculent root, this plant is industriously cultivated on the continent of Europe: it delights in a rich, but not too moist soil; and the seed is put in the ground soon after it becomes ripe.

There are two varieties of this excellent vegetable reared in Italy, both of which might be cultivated in Great Britain; namely, 1 The *dulce*, or sweet fennel; and 2. The *azonicum*, or Italian fennel. The former easily degenerates, and requires a frequent supply of seeds, produced on its native soil; the latter is a delicious plant, the stalks of which, according to BECHSTEIN, are thick, pulpy, and from four to five inches broad: they are highly esteemed by the Italians, who blanch and eat them as salad, prepared with flour, vinegar and pepper. Hence the popular adage in that country, according to which "fennel and bread are the Italian's repast."

FERMENTATION. The word fermentation, in general, is used to denote that change in the principles of organic bodies which begins to take place spontaneously as soon as their vital functions have ceased, and by them are at length reduced to their first principles. This has been distinguished into three stages, the vinous or spiritous, the acid or acetous, and the putrid fermentation. It is ascertained almost beyond doubt, that the vinous fermentation takes place only in such bodies as contain saccharine juices. In this the most remarkable product is a volatile, colourless, slight inflammable fluid, which mixes with water, in all proportions, and is called alcohol, which see. The acetous fermentation is distinguished by the product known by the name of vinegar, which is the least destructible of the vegetable acids. It does not appear, however, that fermentation is absolutely necessary for the production of this acid, as there are many other chemical processes by which it may be obtained or produced. In the putrid fermentation, bodies appear to be reduced into their most simple parts. Ammonia is the product which has been remarked as the chief of this process, and is, no doubt, produced by the combination of the hydrogen and nitrogen gases, which are disengaged together. See AMMONIA.

FERN, the FEMALE, or *Pteris aquilina*, L. a plant growing on heaths, in woods and dry barren places, and flowering in the month of August.

This weed is extremely difficult to be eradicated, as its roots, in soft and deep soils, have been found at the depth of *eight* feet. One of the most effectual methods of extirpating the fern is, to mow the grass frequently; and if the field be ploughed up, and well dunged, this plant will not thrive:—urine is said to be of considerable efficacy in checking its vegetation. It may also be easily destroyed, by means of an instrument consisting of a stick, in which is inserted a blade, with blunt edges, and with which the stems of the plant are to be bruised. Several acres may thus be cleared, even by a woman, in the course of one day: the next morning a gummy matter will exude from the injured stalk, and the fern will gradually disappear. The ashes of fern afford a profitable quantity of potash.

FERN, the MALE, or Male Polypody, *Polypodium Felix-mas*, L. is a plant growing in woods, heaths, and stony places, and flowering from June to October.

The vermifuge powers of fern are well known. It appears to be particularly active in expelling the tape-worm, which is very troublesome. Dr. G. JONES relates the case of a lady in N. York, who after taking many worm medicines with partial good effects, drank a decoction of *fern* in water, (a pint a day) until some gallons were taken, when a dose of castor-oil brought away the remnant of the worm, measuring 45 feet!

The male fern is the famous remedy of Mad. NOUFFER, of Switzerland, for the tape-worm. She acquired the knowledge of the remedy from her husband, who was a surgeon, and obtained a great price for the secret from LOUIS XVI. of France, by whose order it was published. The powdered plant was generally preferred by Mad. N. and may be given in doses of from 60 grs. to two drachms.

FERRET, or *Mustela Furo*, L. an useful animal, which is originally a native of Africa, whence it was introduced into Spain, and subsequently into England. It has red, fiery eyes; the colour of its whole body is of a pale yellow; and its length, from the tip of the nose to the end of the tail, is about 19 inches.

The ferret requires to be kept carefully within doors, as, unlike other wild animals, it is incapable of procuring its own subsistence. The female is of a smaller size than the male, and produces twice annually from five to six, and sometimes even eight or nine young ones, after a gestation of six weeks.

These animals are employed for the purpose of hunting rabbits, to which they are mortal enemies.—They are always muzzled previously to being admitted into the burrows, in order that they may not kill the rabbits, but only drive them out of their holes into nets, spread out for the purpose of taking them. In the west of England, they are frequently kept in farm-yards and barns, for the purpose of destroying the mice and rats infesting corn-stacks. —Ferrets are reared in casks or boxes, where they are provided with beds of hemp or flax. They sleep almost continually, and, on waking, very eagerly search for food, which consists chiefly of bread, milk, &c. They are easily tamed, and rendered docile, but are extremely irascible; and as they at all times emit a disagreeable odour, it increases and becomes extremely offensive when they are irritated.—Their motions are nimble; and they are at the same time so vigorous, that they can easily conquer a rabbit, which is at least four times larger than its adversary.

FESCUE-GRASS, or *Festuca*, L. a genus of plants consisting of 39 species; though only 12 or 14 are indigenous, of which the following are the principal:

1. The *ovina*, or Sheep's Fescue-grass, which is perennial, grows in dry, sandy soils, and flowers in the month of June. This plant is eaten by cows, horses, goats, and especially by sheep, which are very partial to it, and soon become fat from its use.

2. The *rubra*, Creeping or purple Fescue-grass, which is perennial, grows on elevated heaths and dry barren pastures, and flowers in the month of June. This grass is of great value in the fattening of cattle, as its succulent leaves, which continue to vegetate during the whole summer, at all times furnish abundance of wholesome food. It also possesses the advantage of retaining its verdure throughout the winter, when almost every other vegetable is decayed.

3. The *duriuscula*, or Hard Fescue-grass, which is also perennial, grows as well in dry places, as in low and flat meadows; and flowers in the month of June. It has not hitherto been cultivated, though it claims the attention of the intelligent farmer; for it frequently attains the height of three or four feet, shoots forth very early in the spring, is very luxuriant, and affords a wholesome and grateful food to all kinds of cattle.

4. The *elatior*, or Tall Fescue-grass, which grows in boggy meadows, and at the sides of wet ditches, where it often attains the height of four or five feet. It is perennial, flowers in the month of June or July (sometimes twice in the year), and makes excellent pasture, but requires a rich soil.—It is eaten by horses, cows, sheep, and goats. There is a variety of this grass, called by Mr. CURTIS, the *Festuca pratensis*, or meadow fescue-grass, which will thrive not only in very wet, but also in dry soils. This variety possesses a property, on account of which it deserves to be more generally cultivated, namely, that of producing abundance of seeds, which speedily grow, and are easily collected. It bears a close resemblance to ray-grass, though it is in many respects greatly superior to the latter, at least, for the purpose of making and improving meadows; as it is perennial, larger, more productive of foliage, and very hardy.

5. The *fluitans*, or Flote Fescue-grass, which is common in wet ditches, ponds, and marshy places; it flowers from June to September. This plant is remarkable for its small but very sweet and nutritious seeds: they are collected in several parts of Germany and Poland, under the name of *manna seeds*; and used in soups, gruels and puddings, both for their excellent aliment, and agreeable flavour. When ground into meal, the seeds may be converted into bread, which is little inferior to that made of wheat. The bran, separated in preparing the meal, is given to horses troubled with worms; but no water should be allowed these animals for several hours afterwards. Beside the useful purposes before mentioned, the flote-fescue is a valuable grass for cattle; being so remarkably grateful, especially to horses and hogs, that they will endanger their lives in obtaining it; but as it grows only in waters which have a miry bottom, it cannot be cultivated.—The Cottenham and Chedder cheese, in a great measure, derive their celebrity from this grass.

6. The *myurus*, or Wall Fescue-grass, or Capon's-tail grass, which grows on walls, dry, barren places, and road sides; it produces violet stalks from 16 to 24 inches high, and affords a sweet, nourishing pasture: hence it might be cultivated with advantage, on the poorest soil, where few other grasses will thrive.

FEVER, a general term for a numerous and diversified class of diseases; in which, after shivering, succeed increased heat and a quick, irregular pulse; while several of the animal functions are impaired, and the muscular strength, particularly that of the joints, is remarkably diminished. [The theory of fever is by no means settled. —T. C.]

For the treatment and cure of fever, in general, it is impossible to lay down any precepts which are applicable to every individual: we shall, therefore, refer to the article under the head of Domestic Medicine.

FIBRIN. If a quantity of blood newly drawn from an animal, be allowed to remain at rest for some time, a thick red clot gradually forms in it, and subsides. Separate this clot from the rest of the blood, put it into a linen cloth, and wash it repeatedly in water till it ceases to give out any colour or taste to the liquid; the substance which remains after this process, is denominated fibrin. It has been long known to physicians under the name of the fibrous part of the blood; but has not till lately been accurately described. It may be procured also from the muscles or flesh of animals.

FIG-TREE, or *Ficus*, L. a genus of plants, comprising forty-three species, of which one only is cultivated in this country, namely, the *carica*, or common fig-tree. It is propagated either by suckers arising from the roots; by layers; or by cuttings. The first are to be taken off as low down as possible; all ragged and superfluous parts being removed, and the tops left entire, especially if intended for standards. These are to be planted in nursery-rows, two or three inches apart; or, they may be set in the spot where they are intended to remain. They are then suffered to branch out and form a head, care being taken that the branches never be shortened; for, as the figs are always produced on the upper part of the young shoots, if these be cut off, no fruit can be expected.

The best season for raising fig-trees by *layers*, is in autumn: the young pliable lower shoots are first to be selected from the moist fruitful branches, which are to be *laid* in the usual way: the body of the layers being covered with soil to the depth of three or four inches, and the top kept as upright and entire as possible. In the succeeding autumn, they will be fit to be separated from the parent-stock, when they may be planted either in the nursery, or in the place of their ultimate destination.

The time for propagating by *cuttings*, is either in autumn, or at any time during the month of March. The shoots to be selected for this purpose, ought to be those of the preceding summer; short, and strong; from 12 to 15 inches in length; and to have at least an inch of the two years wood at their base; the tops being left entire These cuttings are to be set 6 or 8 inches deep, in a bed of good soil, in rows 2 feet apart: and, if they be planted in autumn, it will be requisite to protect the tops from the severity of the winter, with any kind of loose, long litter.

Fig-trees require a free exposure to the rays of the sun, at the side of an espalier: they ought to be frequently watered; and, according to Bechstein, wood-ashes are for them a more proper manure than dung. Towards the winter of our colder climate, the root of the fig-tree ought to be somewhat loosened, and the trunk bent down in the form of a bow, and covered with straw to protect it from the severity of the frost.

There is a mode of increasing and ripening the fruit of the domestic fig-tree, by means of insects: it is practised in the Levant, and known by the name of *caprification*. The principal of those insects appears to be the *cynips psenes* that deposits its eggs in the figs; from these arise small worms which, when covered with the *pollen* or flower-dust, migrate from the male flowers, take shelter in the female ones, and thus effect fructification. In consequence of this natural process, the figs not only ripen more speedily, but also become much larger: so that a fig-tree which formerly produced about 25 lbs. of ripe fruit, now yields nearly 300 lbs. Later experience has proved that *caprification* may be successfully imitated in gardens, by wounding the buds of the figs with a straw or feather dipped in sweet oil. Bechstein advises a drop of olive oil to be introduced into the calyx of the figs when half ripe, and to repeat this unction every four or five days: as it will remarkably promote the growth and maturing of the fruit. Plums and pears also, when wounded by insects, have been observed to ripen at a more early period, and the pulp about the wounded part to acquire a more delicious flavour.

The principal varieties of the common fig are, the brown, or chesnut coloured Ischia fig, the murrey, or brown Naples fig; the common blue or purple fig: and lastly, the Turkey fig, which is in the greatest estimation, and is imported in considerable quantities into this country.

Figs contain a large portion of mucilage, and a small quantity of oil. They are grateful to the stomach, and more easy of digestion than any other sweet fruit; they abound with saccharine matter, and are very nutritious, though they are apt to occasion flatulency, when eaten without bread or other mealy substances. A decoction of figs affords excellent gargles to cleanse the throat and mouth: this fruit also forms an ingredient in lenitive electuaries, and pectoral draughts; it is likewise applied externally to soften, digest, and promote maturation. When in an unripe state, figs, as well as the whole tree, yield an acrid milky liquor, which, if taken as a medicine, proves both purgative and emetic; but externally affords a mild caustic: hence it is frequently employed for the removal of warts. This juice has also been substituted for *sympathetic ink;* as the characters written with it, do not appear visible till they are exposed to a fire.

Figs ripen very well by the middle of September, in Philadelphia, when enjoying a free exposure to the sun. In the southern states they flourish luxuriantly, and might become an article of extensive export and home consumption, if pains were taken to introduce the large Levant fig.

FILAMENT, in natural history, a fibre or fine thread in flesh, nerves, skin, plants, and roots, and other substances. Putrefaction destroys the pulpy or fleshy matter, and leaves the tough filaments entire: thus, by putrifying the leaf of a plant in water, the fibres, which consitute the basis of the ribs and minute veins, are obtained complete. Alkaline lixivia in some degree operate in a manner similar to putrefaction. Vegetable filaments are the materials of many manufactures. In Britain, the filamentous parts of hemp, flax, and cotton are worked into cloths; in Madagascar, slight cloths of a softness approaching to silk, and others of a coarser and very durable texture, as well as sail-cloth and cordage, are made from the bark of certain species of trees. In France, the filaments of nettles are applied to the same variety of purposes; and it has been suggested that the muslins and calicoes of India are made from the same plant. In Sweden, a strong cloth is said to be made of the stalk of the hop. In Otaheite, cloth is made from the bark of trees.

FILARIA, a genus of the class vermes, and order intestina: the most destructive is the Filaria medinensis, or Guinea-worm; which inhabits both Indies, and is frequent in the morning dew, whence it enters the naked feet of the slaves, and creates the most troublesome itching, accompanied with inflammation and fever. It is frequently from eight to ten feet in length, and not larger than a horse-hair.

FILBERDS. See HAZLENUT-TREE.

FILE, a tool employed by smiths and others, for the purpose of smoothing, polishing, or cutting metals.

FILLAGREE-WORK, a delicate and elaborate manufacture, primarily executed in threads of gold and silver, but lately imitated with coloured and gilt paper. There is no manufacture in any part of the world that has been more admired and celebrated than the fillagree of Sumatra, of which a minute history is given in MARSDEN's account of that island. The work usually executed by young ladies in England under the title of fillagree, and of which caddies, vases, &c. are constructed, is formed of narrow slips of coloured paper, or gilt at the edges, and curiously rolled up and glued in various fanciful forms. The Chinese also make fillagree mostly of silver, which looks elegant, but wants likewise the extraordinary delicacy of the Malay work. The price of the workmanship depends upon the difficulty or uncommonness of the pattern. In some articles of usual demand, it does not exceed one third of the value of the gold; but in matters of fancy, it is generally equal to it.

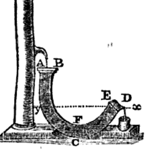
FILM, in farriery, is a thick pellicle or skin, that is formed on the eyes of horses; in consequence of which their sight is impaired.

In order to disperse the film, it has been recommended to reduce common salt and sugar of lead, to a fine powder, and put a little into the eye, so as to corrode the film. Another remedy consists in applying a small quantity of finely pulverised sal ammoniac daily to the part affected, till the obstruction be removed. [But the best way is to consult a veterinary surgeon.—T. C.]

FILTRATION, in chemistry, as well as in domestic economy, is the process of straining or filtering liquors by means of woollen cloth, cotton, linen, paper, or other materials. It deserves to be previously remarked, that in every attempt at purifying fluids in the manner here alluded to, we can divest them only of those foreign ingredients which are *mixed* with them, and not of such as they hold in *solution*. The former may be separated from them, by proper filtration; but the latter must be disengaged, either by precipitation or distillation. Although the utility of filtration is thus limited to the noxious particles *mixed* with liquid bodies, such as foul water, yet it is sufficiently important to deserve some attention.

The common filters are of two sorts; namely, simple pieces of paper, or cloth through which the fluid is passed; or similar materials twisted up in the same manner as skeins or wicks; they are first wetted, then squeezed, and one end put into the vessel, which contains the liquor to be filtrated; the other end is to be suspended beneath the surface of the liquor, the purest parts of which drop gradually out of the vessel, leaving behind the coarser particles.

Professor Parrot, jun. of Paris gives his filtering machine the form represented in the following cut:



The principal part of the machinery consists of a square vessel, bent in the form of an inverted syphon. The curve may be circular, elliptic, or in any other direction. This vessel is filled with fine pure sand, till nearly the height of the dotted line x, y, which denotes the ascent of the water to D, whence it flows into the receiver. The part marked A, B, should always project above this line according to the size of the filtering machine. To A, B, there is attached a woollen bag, which is open at the top, and the lower part of which touches the sand. It serves the purpose of collecting the coarsest impurities, and thus preserves the sand for a longer time from becoming foul. The bag, therefore, may occasionally be removed, and rinsed in clean water. It is evident, that the water flows at A, through the bag into the filtre, and rises at the place marked D, which is considerably lower than the former. It affords a very agreeable sight to observe the most limpid fluid penetrating the uppermost stratum of sand, perfectly similar to that oozing from the purest natural spring.

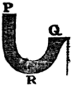
Professor Parrot remarks, that he procured a filtering machine made of block-tin, for ascertaining by experiments the purity and quality of water, that may thus be obtained in a given time. It consisted of the following dimensions: the small diameter B, E, was eight Paris inches: the large of the whole machine, eleven inches; consequently the thickness of the vessel A, B, was one inch and a half; the breadth of it, two inches and seven-eighths. The perpendicular height of the lower side, from C, its basis, to the rim D, whence the water issues, was four inches and one-twelfth; the opposite height of the mouth A, B, eight inches and three-fourths; and the height of the sand on the side marked D, was three inches and one sixth.

Although, in experiments of this nature, much depends on the relative size and purity of the sand, which necessarily afford different results, yet Professor Parrot has, after repeated trials, deduced the following conclusions, which appear to be well-founded.

1. That the difference of the *niveau*, or water-level, has an essential influence on the quantity of the purified water thus obtained. 2. That a prolongation of the sand does not considerably diminish the product of the filtre, but remarkably contributes to the purity of the fluid. 3. That if the water be forced to pass through the sand with increased velocity, it will be less pure than by allowing it a proper time for its passage; and, 4. That a machine of the dimensions above described, will furnish about three quarts of water in an hour, or eighteen gallons in twenty-four hours. This quantity, however, being too large in proportion to the size of the machine, it is advisable, either to lessen the difference of the water-fall; or, which is still better, to prolong the stratum of sand, in order to reduce the filtration of the water to half the quantity above stated, and to obtain it in greater purity. Thus, a filtering apparatus, eighteen inches long from A, to D, two inches thick, and four broad, would afford every hour six pints of very pure water. If, therefore, so small a machine, containing a very moderate stratum of sand, and requiring only a difference of two or three inches in the height of the water, furnishes a clear and pure fluid, it follows, that an apparatus on a larger scale, provided with a bed of sand from five to six feet long, and admitting of a difference from twelve to eighteen inches in the fall of the water, might

be usefully employed in public wells, hydraulic machines, and even in camps, for the supply of an army.

In the construction of large filtering machines, Prof. Parrot justly observes, that they should not be extended in the direction A, C, D, to a greater length than is absolutely necessary; as, in this case, they will not require any considerable difference in the fall and rise of the water: on the other hand, their breadth and thickness may be accordingly increased.—Thus, the diameter of such a machine would still more resemble that of a syphon, as is represented in the annexed cut.



This form might be also adopted for smaller machines, especially such as are designed for *travellers*, two of whom might be amply provided with pure water, and in a very short time, by a vessel of the following dimensions: from P, to Q, eight inches long; from P, to R, twelve inches high; and the whole four inches in breadth.

If the form last delineated be employed on an extensive scale, there should be a trap door in the lowermost part marked R, so constructed, that it may fit exactly, and admit no passage to the water: this aperture would serve only for the removal of the sand, when it is rendered foul by long use. In the smaller machines, intended for travelling, such a door is unnecessary, as they may be easily emptied of their contents through either of the orifices P, or Q. Instead of this addition to the latter, the upper room, (which in the first of these cuts is circumscribed with the letters B, F, E), might serve as a reservoir of pure water, that could either be decanted, or drawn off by means of a cock applied to the centre of the machine, marked F. We think, however, this latter arrangement, which is proposed by M. Parrot, in many respects objectionable, and therefore advise the reader to make use of the more simplified construction. Hence we shall only add, that every filtering machine ought to be provided with a cloth cover, to prevent the dust from rising with the water, without impeding its filtration.

It is needless to expatiate on the great advantages of filtering machines in the different processes of dyeing, baking, brewing, distilling, and all the domestic arts. As no particle of real nutriment can be assimilated to the human fluids, without being previously macerated and reduced by *water* (whether this fluid be introduced into the stomach, in the form of beer, wine, spirits, tea, &c.) it will be easily understood that *impure* water cannot fail to produce, however slowly, many dangerous, and often incurable diseases—the source of which is seldom suspected. See Water.

A filtering machine was invented a few years since in Paris, by Mr. Smith, which purified a great quantity of water; it would contain about eight gallons of water, and being wickered, was rendered very portable: the whole machine not taking up more space than half a barrel. It is understood, that the process consists of passing the water, first through sponge, and then through alternate layers of chalk, sand, and charcoal, [with a layer of flannel interposed: the machine should also have a perforated false bottom about 2 inches above the true bottom. Vinegar and many other liquors may be purified by passing them through animal charcoal, such as bone or ivory black.—T. C.]

On board of a ship, a barrel, keg, or bucket may be used, by boring a hole in its bottom, and instead of spunge, a piece of loose oakum may prevent the coal from escaping with the water; one third of the vessel is then to be charged with powdered charcoal, or common coals extinguished by water; another third with sand, or, if not to be had, pounded crockery, or bricks from the caboose; the upper space left for the water desired to be purified; the water, though ever so obnoxious, will pass through, cleared from all foreign matter, as sweet and pellucid as the finest pump-water.

FINING. See Clarification.

FIR-TREE, the name of several species of the *Pinus*, or Pine-tree, of which the following are the principal:

1. The *sylvestris*, or Scotch fir, which is a native of Scotland, and flourishes best in a poor sandy soil, especially if it be mixed with loam: on rocks or bogs it seldom attains a large size; if planted in a black soil, it becomes diseased; and, on chalk-lands, it perishes.

This species of fir thrives most luxuriantly on the north and east sides of hills, where it not only grows more rapidly, and attains a greater height, but the grain of its wood is also more compact, and the trees are fuller of sap than if they had been planted in another direction.

The Scotch fir is propagated from seeds, which are obtained from the cones or fruit it produces. The proper time of sowing, is in the latter end of March, or beginning of April; if the seeds be set in a grove, the tree becomes tall and naked; if in open situations, exposed to the sun, it becomes branched. At the age of four years, it is to be transplanted to the place where it is intended to remain; during which operation the utmost caution should be taken, that the central or tap-root be not broken off, or in any manner impeded in its growth; as, in that case, the stem would cease to shoot upwards, and the tree remain a dwarf. But notwithstanding every care taken by the industrious planter, his hopes are often frustrated by predatory animals, such as squirrels, that strip the whole bark off the young tree, in consequence of which it dies, and is broken by the first high wind. The hare is another enemy to young firs, though less dangerous: it is affirmed that hares may be drawn away from them, by sowing in their vicinity the *Cytisus Laburnum*, a species of the Bane-trefoil, the young shoots of which they prefer to firs.

This species of the fir, is one of the most useful plants in the whole vegetable creation: it furnishes the best red or yellow deal, which is employed in the making of masts, floors, wainscots, tables, boxes, and for numberless other purposes The trunk and branch of this species, in common with the rest of the pine-tribe, afford excellent pitch and tar. The tops, or young tender shoots, are an useful substitute for fodder, especially during the winter season. The roots, when divided into small splinters, are employed by the poor as a substitute for candles. The outer bark is of considerable use in tanning leather; the inner rind is, by the inhabitants of Loch-Broom, in the county of Ross, converted into ropes. In the more northern parts of Europe, it is, in times of scarcity, made into bread; for this purpose, the inhabitants select a tree, the trunk of which is smooth, and contains the least portion of resin; they strip off the bark in the spring, dry it gently, then reduce it to powder, and knead it with a small quantity of corn-meal and water, in which state it is baked into bread. The young cones, when distilled, afford an essential diuretic oil, somewhat resembling that of turpentine: a resinous extract is likewise prepared from them, and believed to possess virtues similar to those of the balsam of Peru. An infusion of the buds is highly recommended as an antiscorbutic.

An experiment is now making with the *fir*, as a hedge, by Mr. Coxe, near York-Town, in Pennsylvania, whose experience of the tree in Europe, has induced him to import them, and attempt their propagation.

2. The *Abies*, or Spruce-fir, which is a native of the northern parts of Europe, whence it has been introduced into this country. It is propagated in the same manner as the Scotch-fir, and delights in a dry, gravelly situation, though it will thrive in almost every soil. It also succeeds on a loam, and even on a hard, dry rock; but frequently decays at the end of 18 or 20 years, if planted on a stiff, wet clay. The same precautions as are to be observed in transplanting the Scotch-fir, ought to be more carefully attended to with respect to the Spruce-fir, which should be set exactly in the same direction in which it stood before; as, by turning the bark to another quarter of the compass, the tree generally perishes.

There are two varieties of this species, namely, the white and black spruce; the wood of both is very light, and decays when exposed to the air for a considerable length of time: it is chiefly employed for packing-cases, musical instruments, and the like. Its branches form the principal ingredient in preparing the essence of spruce, from which spruce beer is brewed. A fine clear *turpentine* oozes from these trees: the Indians of North-America are said to employ it in curing green wounds, as well as certain internal disorders: the resin which distils from the White Spruce fir, in particular, is supposed to be a sovereign remedy in fevers, and in pains of the breast and stomach. In Britain, this resinous juice is boiled in water, and strained through a linen cloth, by which process, it acquires a solid consistence, a reddish brown colour, and an odour by no means disagreeable; whence it is called *Burgundy pitch*. In obstinate coughs, affections of the lungs, and other internal complaints, plasters of this resin, by acting as a topical stimulus, are frequently found of considerable service.

3. The *Picea*, or Yew-leaved Fir;

which is a tall ever-green, and a native of Scotland, Sweden, and Germany. This species also produces two varieties, viz. the *Silver Fir*, and the *Balm of Gilead Fir*. The former grows to a great height (in Germany sometimes rising to 180 feet), and has received that name from the white appearance of its leaves. It is very hardy, and will thrive in any situation; but prospers remarkably in a rich, loamy soil. The balm of Gilead fir is eminently calculated for ornamental gardening, on account of the beauty of its form, and the fragrance of its foliage. It ought to be planted in a rich, good earth, as it grows best in a deep, black, sandy mould, where its roots have sufficient room to strike freely. From this variety exudes the resinous juice, erroneously called *Balm of Gilead*, on account of its possessing the same properties as that which is produced from the *Pinus balsamea*, or Hemlock fir, a native of Virginia and Canada, but seldom cultivated in England. In common with the other turpentines obtained from the pine tribe, that of the balm of Gilead fir is a hot, stimulating, and detergent medicine; small doses of it have sometimes been successfully used in chronic rheumatisms and palsy.

The different species of fir are infested by a variety of insects; the most formidable of these, is a brown grub, about $\frac{1}{10}$ of an inch in length, which changes into a brownish moth, resembling those producing the grubs which infest apple and pear-trees. These moths deposit their eggs in the heads or tops of the firs, where they are hatched in the month of May, when the young grubs eat their way into the leading branches, and consume the pith in their course. They continue their depredations till the beginning of June, when they assume the form of chrysalis, and lie in a torpid state till mid-summer, at which period they become perfect moths. As these insects multiply most rapidly, the greatest caution is necessary in planting firs, that they may not be propagated from an infected nursery; in which case, it will be extremely difficult to extirpate the vermin. The only effectual method of destroying them is, to lop off, in the month of May, the branches thus infested; for, after the trees have attained a height exceeding ten or fifteen feet, there is no remedy. [One of the most useful and beautiful of the firs, is the larch, PINUS LARIX.—T. C.]

FIRE, CALORIC. The properties of caloric are four in number: 1. It causes *expansion*; 2. It causes *fluidity*; 3. It causes *evaporation*; 4. It causes *combustion*.

1. When caloric enters into the pores of bodies, that is, when, according to the usual expression, bodies become hot, they expand in every direction in a degree proportionate to the quantity of caloric they contain.

Different bodies, however, expand in different proportions; that is, their fitness to imbibe caloric is different. This part of the subject belongs to the *attraction of combination*; according to which theory bodies are said to have more or less *affinity* for caloric.

2. The second effect of the presence of caloric is that of rendering solid bodies fluid. Ice is the state of water while it contains only a very small portion of caloric; but the particles of this body have so strong an affinity or attraction for caloric, that it is perpetually ready to become fluid by the accession of that body. The phenomena of expansion and fluidity result from the same operation of caloric; that of entering into the pores of bodies, separating their particles, and, by the addition of its own bulk, necessarily increasing their's.

3. As by the application of heat or fire, solid bodies are expanded, so by a continuation and increase of it their particles are dissolved and rendered fluid; and if heat continue to be accumulated, what was before a common or incompressible fluid, will become an elastic fluid. In common language, it will *boil*, and in process of time dissipate in vapour.

4. Combustion, or the act of *consuming*, implies the emission of fire from some body in which it existed in a latent state, and the destruction or rather change of some other body. Fire is contained in the largest quantity in air: and the pure part of it, that is, *oxygen*, being disposed to unite with many other matters, most of the ordinary processes of combustion and inflammation are the result of the sudden union of oxygen with some other substance, in which case the fire which was contained in the oxygen of the air, is disengaged and let loose.

The securing of houses and other buildings against this devouring element, is an important object of enquiry: we shall briefly state a few of the most remarkable experiments, together with the result or success which has attended them.

Dr. HALES first proposed a plan of covering the floors of houses with earth

The thicker the mould is laid on the floors, the greater is the security. He supposes that the depth of an inch will be amply sufficient; though he recommends to lay a deeper coat on the stairs; because fire, in general, ascends by means of stair-cases with the greatest velocity.

A patent was granted in April, 1773, to David Hartley, Esq. of Golden-square, for his method of securing buildings and ships against fire.

Lord Mahon has invented a simple and effectual mode of securing every kind of building against all danger of fire: he divides it into three parts, namely, *under-flooring*, *extra-lathing*, and *inter-securing*. The first part or method, is either single or double. In *single under-flooring*, a common strong lath, one quarter of an inch thick, should be nailed against each side of every joist and main timber, supporting the floor which is to be secured. Similar laths are then to be nailed on the whole length of the joists, the ends of which abut against each other. The top of each lath or fillet, ought to be an inch and a half below the top of the joists or timbers, against which they are nailed, so as to form a small ledge on every side. When these fillets are nailed on, they should be laid in a rough plaster, which ought to be spread on the tops of such fillets, so as to leave no vacant space between them and the joists. Short pieces of common laths are next to be nailed closely together, in a direction contrary to that of the joists; the ends of the former are to rest on the fillets, and to be well bedded in rough plaster, but not fastened with nails. They are next to be coated once with the plaster, which is to be spread over them to the tops of the joists. In *double-flooring*, the fillets and short pieces of laths are applied in the manner already described; the coat of rough plaster ought, however, in this method, to be somewhat more than half as thick as that in single-flooring. While the rough plaster is laying on, some additional short pieces of laths are to be inserted between the joists upon the first coat, as closely to each other as possible, and in the same direction as the first layer of laths. Over this second layer of short laths, another coat of rough plaster should be spread, which ought to be trowelled level with the tops of the joists.

As soon as the plaster-work between the joists is perfectly dry, it should be inspected, in order to ascertain whether there be any small cracks, especially next to the joists. Should any occur, it will be requisite to close them, by washing them over with a brush, wetted with mortar-wash, which may be prepared by mixing two measures of quicklime, and one of sand, in a pail, and tempering the whole with water, till it acquires the consistence of a thin jelly.

Previously to laying down the flooring boards, a small quantity of dry common sand should be strewed over the plaster-work, and struck smooth with a hollow rule in the same direction as the joists are laid, so that it may lie *rounding* between each pair of joists. Particular attention should be paid to the plaster-work and sand, that they be perfectly dry before the boards are laid, lest the latter become infected with the dry-rot. The mode of under-flooring may be successfully applied to a wooden stair-case; but no sand is then to be laid upon the plaster-work. The method of extra-lathing may be practised on ceiling-joists, sloping-roofs, and wooden partitions.

The third method, namely, *inter-securing*, is similar to that of under-flooring; but no sand is afterwards to be laid over it. Inter-securing is applicable to the same parts of a building as the method of extra-lathing; but it is seldom necessary to be employed. Lord Mahon made several experiments, which shew the utility of this invention; for which we refer the reader to the 68th volume of the "*Philosophical Transactions of the Royal Society*," for 1778, where he will find a satisfactory account of the manner of preparing the mortar, as well as the result of numerous trials made by the inventor.

The most expeditious way of extinguishing fire is a matter of equal importance, as the security of buildings from that destructive agent: but none of the mixtures hitherto proposed, are free from difficulties and disadvantages that counterbalance their good effect.

Water engines for extinguishing fire. These are either forcing or lifting pumps. [The best of these beyond comparison are manufactured by Perkins and Bacon of Philadelphia, and that the reader may be enabled to compare the power with the price, I insert an abstract of their proposals.—T. C.]

Perkins and Bacon manufacture fire engines of four grades.

Their 1st class city engines cost 650 dollars, and they discharge a ton of water per minute, and project it 180 feet, with the power of 32 men.

2d class city engines cost 550 dollars, and discharge three quarters of a ton per minute, and project it 170 feet with the power of 26 men. Either of these are made to play two steady streams at the same time by adding 50 dollars to the cost.

1st class village engines cost 300 dollars; discharge 110 gallons per minute, and project it with the power of 12 men 135 feet.

2d class village engines cost 250 dollars; discharge 75 gallons per minute, and project it by the power of ten men 125 feet.

They make garden or house engines for 50 dollars.

Their supply pump, which frequently accompanies the engine, takes up the waste water from the street, (or from pumps, ponds, rivers, &c.) and returns it into the engine in a perfect state for playing. Their engines are but little liable to get out of repair, and are easily put in order when they are so.

FIRE-BUCKETS. It is a general complaint at the extinguishing of fires, that the water, as it is handed along from the pump to the engine, is continually spilling out of the buckets; to the great annoyance of the persons employed in this service, and the great waste of water: so that by the time the bucket arrives at the engine, it is frequently not more than half full.

The form of the buckets, as they are most commonly made, no doubt contributes to this inconvenience; and if they were made of cylindrical form, or no wider at the mouth than at the bottom, the evil would, in some measure, be remedied, but would still, however, exist in a considerable degree.

The following simple appendage which has been proposed by a correspondent in the *Weekly Mag.* Philadelphia, 1798, to be added to any bucket, at a very trifling expense, will be found an effectual remedy, and without in the least impeding either the filling or the emptying of the bucket:—For this purpose, provide a thin circular board of cedar, or other light wood, of the size of the bottom of the bucket inside. This board may be strengthened by tacking on, across the wood, one or two small strips or battens. Let a piece of strong twine be made fast to the centre of this board, and also to the centre of the bottom of the bucket, inside; and of such a length as to suffer the board to rise within about an inch of the mouth of the bucket. When the bucket is empty, this board will be on the bottom, and can, therefore, be no obstruction in filling it at the pump; and when filled, it will float on the surface of the water, and in no measure impede its being emptied into the engine, or even discharged by hand against the fire.

The effect of such a float-board, in preventing the evil above stated, will be too easily conceived to need any further explanation.

FIRE-ESCAPE, a contrivance for the purpose of rescuing persons in imminent danger from fire.

FIRE-PLACE, a contrivance for communicating heat to rooms. The great fault of all the open fire-places, or chimnies, for burning wood or coals in an open fire, now in common use, is, according to Count RUMFORD, that they are much too large; or rather it is *the throat of the chimney*, or the lower part of its open canal, in the neighbourhood of the mantle, and immediately over the fire, which is too large. This opening has hitherto been left larger than otherwise it probably would have been made, in order to give a passage to the chimney-sweeper; but a passage for the chimney-sweeper may be contrived without leaving the throat of the chimney of such enormous dimensions as to swallow up and devour all the warm air of the room, instead of merely giving passage to the smoke and heated vapour which arise from the fire, for which last purpose alone it ought to be destined.

As the immoderate size of the throats of the chimnies is the great fault of their construction, it is the fault which ought always to be first attended to in every attempt to improve them; for, however perfect the construction of a fire-place may be in other respects, if the opening for the passage of the smoke is larger than is necessary for that purpose, nothing can prevent the warm air of the room from escaping through it; and whenever this happens, there is not only an unnecessary loss of heat, but the warm air which leaves the room to go up the chimney being replaced by cold air from without, the draught of cold air so often mentioned, cannot fail to be produced in the room, to the great annoyance of those who inhabit it. But, although both these evils may be effectually remedied, by reducing the throat of the chimney to a proper size, yet in doing this, several precautions will be necessary. And first of all, the throat of the chimney should be in its proper place; that is to say, in that place in which it ought to be, in order that the ascent of the smoke may be most facilitated; for every means which can be employed for facilitating the ascent of the smoke in the chimney, must naturally tend to prevent the chimney from smoking; now as the smoke and hot vapour which rise from the fire naturally tend *upwards*, the proper place for the throat of the chimney is evidently perpendicularly *over the fire*. The nearer the throat of a chimney is to the fire, the stronger will be what is commonly called its *draught*, and the less danger there will be of its smoking. But on the other hand, when the draught of a chimney is very strong, and particularly when this strong draught is occasioned by the throat of the chimney being very near the fire, it may so happen that the draught of air into the fire may become so strong, as to cause the fuel to be consumed too rapidly.

In introducing the improvements proposed in chimnies already built, there can be no question in regard to the height of the throat of a chimney, for its place will be determined by the height of the mantle. It can hardly be made lower than the mantle; and it *ought always to be brought down as nearly upon a level with the bottom of it as possible.* If the chimney is apt to smoke, it will sometimes be necessary either to lower the mantle, or to diminish the height of the opening of the fire-place, by throwing over a flat arch, or putting in a straight piece of stone from one side of it to the other; or, which will be still more simple and easy in practice, building a wall of bricks, supported by a flat bar of iron, immediately under the mantle.

Nothing is so effectual to prevent chimnies from smoking, as diminishing the opening of the fire-place in the manner here described, and lowering and diminishing the throat of the chimney; and I have always found, except in a single instance, that a perfect cure may be effected by *these means alone*, even in the most desperate cases. It is true, that when the construction of the chimney is very bad indeed, or its situation very unfavourable to the ascent of the smoke, and especially when both these disadvantages exist at the same time, it may sometimes be necessary to diminish the opening of the fire-place, and particularly to lower it, and also to lower the throat of the chimney more than might be wished.

The position of the throat of a chimney being determined, the next points to be ascertained are its size and form, and the manner in which it ought to be connected with the fire-place below, and with the open canal of the chimney above.

That these inquiries may be pursued with due method, and that the conclusions drawn from them may be clear and satisfactory, it will be necessary to consider; first, what the objects are, which ought principally to be had in view in the construction of a fire-place; and secondly, to see how these objects can best be attained.

Now the design of a chimney fire being simply to warm a room, it is necessary first of all, to contrive matters so, that the room shall be actually warmed; secondly, that it be warmed with the smallest expense of fuel possible; and, thirdly, that in warming it, the air of the room be preserved perfectly pure, and fit for respiration, and free from smoke and all disagreeable smells.

When fuel is burnt in fire-places upon this simple construction, when the smoke escapes immediately by the open canal of the chimney, it is quite evident, that all the combined heat must of necessity be lost; and *as it is the radiant heat alone which can be employed in heating a room*, it becomes an object of much importance to determine how the greatest quantity of it may be generated in the combustion of the fuel, and how the greatest proportion of that generated may be brought into the room.

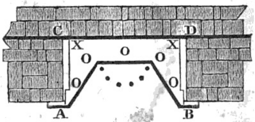
Now the quantity of radiant heat generated in the combustion of a given quantity of any kind of fuel depends very much upon the management of the fire, or upon the manner in which the fuel is consumed. When the fire burns bright, much radiant heat will be sent off from it; but when it is *smothered up*, very little will be generated; and indeed very little combined heat, that can be employed to any useful purpose: most of the heat produced will be immediately *expended* in giving elasticity to a thick dense vapour or smoke, which will be seen rising from the fire; and the combustion being very incomplete, a great part of the inflammable matter of the fuel being merely rarefied and driven up the chimney without being inflamed, the fuel will be wasted to little purpose. And hence it appears of how much importance it is, whether it be considered with a view to economy, or to cleanliness, comfort and elegance, to pay due attention to the management of a chimney-fire.

So many coals should never be put

on the fire at once as to prevent the free passage of the flame between them. A fire should never be smothered; and when proper attention is paid to the quantity of coals put on, there will be very little use for the poker; and this circumstance will contribute very much to cleanliness, and to the preservation of furniture.

For bringing as much radiant heat as possible into the room, we must cause as many as possible of the rays as they are sent off from the fire in straight lines, to come *directly* into the room; which can only be effected by bringing the fire as far forward as possible, and leaving the opening of the fire-place as wide and as high as can be done without inconvenience: and secondly, by making the sides and back of the fire-place of such form, and constructing them of such materials, as to cause the direct rays from the fire, which strike against them, to be sent into the room *by reflection* in the greatest abundance.

Now it will be found upon examination, that the best form for the vertical sides of a fire-place, or the *covings*, (as they are called), is that of an upright plane, making an angle with the plane of the back of the fire-place of about 135 degrees. According to the present construction of chimnies, this angle is 90 degrees, or forms a right-angle; but as in this case the two sides or covings of the fire-place, (A, C, B, D.) are parallel to each other, it is evident that they are very badly contrived for throwing into the room, by reflection, the rays from the fire which falls on them.



[The construction should be that of the inner lines O, O, O, O, O, by which means the radiant heat will be thrown into the room from the slanting sides of the fire-place. The letters O, O, O, O, O, also describe a false back, supplied with air by a tube even with the floor, from the outside of the room; which air, when heated by the fire-place, can be thrown into the room at X, X, or by a tube opening still higher. Indeed there is a great waste of fuel in employing the heated air of the room to supply the fire itself, which should be also supplied by a tube that opens at one end in the fire place, and at the other end, on the outside of the apartment. In large houses much comfort will be found in winter, by having a ten-plate stove with a *large drum* in the cellar: let this be surrounded at 12 inches distance with brick-work, leaving only the door of the fire place exposed. The external air (from the street not from the cellar) being let in between the brick work and the stove, can be couveyed thus warmed, into the common passage from the street door. —T. C.]

The object in view is, to bring radiant heat into the room, hence it is clear that that material is best for the construction of a fire-place which reflects the most, or which *retains the least* of it; for that heat which is *retained* cannot be *reflected*. Rough and dark coloured surfaces, from the experiments of Mr. Leslie, radiate in all directions the heat they receive, better than polished and light coloured surfaces. Tea will keep hot longer in a polished silver tea pot than in one of black wedgewood ware.

The best materials I have hitherto been able to discover, are fire stone, and common bricks and mortar. Both these materials are, fortunately, very cheap; and as to their comparative merits, I hardly know to which of them the preference ought to be given.

Register-stoves have often been found to be of use, but it is because *the great fault of all fire-places constructed upon the common principles, being the enormous dimensions of the throat of the chimney*, this fault has been in some measure corrected by them; but I will venture to affirm, that there never was a fire-place so corrected, that would not have been much more improved, and with infinitely less expense, by the alterations here recommended.

[After all, stoves of thick iron, or brick, are the most economical of fire-places; and they should consist of such a mass of matter to be warmed by the fire within the room, that the smoke shall escape into the chimney, barely warm. The fire should be supplied with air by a pipe from the outside of the room.—T. C.]

FIRE-PROOF, a term which expresses the effect of certain applications to combustible substances, especially in buildings, with a view to prevent them from being reduced to ashes.

[Wooden roofs are a most disgraceful nuisance. They should either be superceded by slates or tiles, or else they should be covered with a coating of hot tar mixed with wood-ashes, and then fine sand should be sifted on the coating while hot. Even this is a very imperfect security while party-walls are so thin and so ill built, and while parapets are rejected.—T. C.]

FIRE-SHIP, in the navy, a vessel charged with artificial fire-works, which, having the wind of an enemy's ship, grapples her, and sets her on fire.

FIRKIN, an English measure for liquids, which is the fourth part of a barrel; it contains eight gallons of ale, soap, or herrings, and nine gallons of beer. Two firkins make a kilderkin.

FISH, in natural history, constitutes a class of animals which have no feet, but always fins; add to this, that their body is either altogether naked or only covered with scales; and that they are aquatic animals, which live mostly, if not always, in water. See ANIMAL KINGDOM, and ICHTHIOLOGY.

The most general, or popular division of these creatures, is into *fresh* and *salt* water fish.

Dr. FRANKLIN having observed in New England, that the herrings ascended from the sea into one river of that country, while a single individual was never seen in another river, separated from the former by a narrow tongue of land, and which communicated also with the sea, this philosopher took the leaves of some plants on which the herrings had deposited their ova, already fecundated, and conveyed them to the river which was deprived of the annual visit of these fish. The success of this experiment surpassed his expectation; the ova were completely productive, and the following year the river was filled with a numerous shoal of herrings, which, since that time, have continued to frequent it. Dr. MITCHILL, of New York, informs us, that he transported two dozen and ten yellow perch from Rochonkoma pond, in Suffolk county, Long-Island, to Success pond in the town of North-Hampstead, a distance of 40 miles. In two years these few fishes multiplied so fast, that they might be caught with a hook in any part of the water, which is about a mile in circumference! "Planting" oysters, as it is termed, is a common practice.

When fish are kept in large pools or ponds, boiled malt, or fresh grains, are proper food; thus, carp may be reared and fed like capons, and tench will also prosper. If reared in a stew, any sort of corn, or leguminous fruit boiled, especially peas and malt coarsely ground, are equally fattening.

FISHERY, a place where fish are caught in great abundance. The principal fisheries for salmon, herring, mackrel, pilchards, &c. are along the coasts of England, Scotland, and Ireland; for cod, on the banks of Newfoundland; for whales, about Greenland; and for pearls, in the East and West Indies.

FISHERY, *Anchovy*. Anchovies are fished for on the coast of Provence, in the months of May, June, and July, at which season shoals of this fish regularly come into the Mediterranean through the straits of Gibraltar. They are likewise found in plenty in the river of Genoa, on the coast of Sicily, and on that of the island of Gorgone opposite to Leghorn; these last are reckoned the best. Anchovies are seldom fished for but in the night time. If a fire be kindled on the poops of the vessels used for this fishing, the anchovies will come in greater numbers into the nets; but then it is asserted, that the anchovies taken thus by fire, are neither so good nor so firm, and will not keep so well, as those which are taken without fire. When the fishery is over, they pull off the heads of all the anchovies, gut them, and afterwards range them in barrels of different weights, the largest of which do not weigh above 25 or 26 pounds, and they put a good deal of salt in them. Some also pickle them in small earthen pots made on purpose, of two or three pounds weight, more or less, which they cover with plaster to keep them the better.

FISHERY, *Cod*. There are two kinds of cod-fish, the one green or white cod, and the other dried or cured cod, though both are the same fish differently prepared, the former being sometimes salted and barrelled, then taken out for use, and the latter having lain some competent time in salt, dried in the sun or smoke. We shall therefore speak of each of these apart; and first of the

Fishery, *Green Cod.* The chief fisheries for green cod are in the bay of Canada, on the great bank of Newfoundland, on the isle of St. Petre, and the isle of Sable, to which places vessels resort from divers parts both of Europe and America. The most essential part of the fishery, is to have a master who knows how to cut up the cod, one who is skilled to take the head off properly, and, above all, a good salter, on which the preserving them, and consequently the success of the voyage, depends. The best season is from the beginning of February to the end of April; the fish, which in the winter retire to the deepest water, coming then on the banks, and fattening extremely. What is caught from March to June keeps well, but those taken in July, August, and September, when it is warm on the banks, are apt to spoil soon. Every fisher takes but one at a time: the most expert will take from 350 to 400 in a day; but that is the most, the weight of the fish, and the great coldness on the bank, fatiguing very much. As soon as the cod are taken, the head is taken off; they are opened, gutted and salted, and the salter stows them in the bottom of the hold, head to tail, in beds a fathom or two square; laying layers of salt and fish alternately, but never mixing fish caught on different days. When they have lain thus three or four days to drain off the water, they are replaced in another part of the ship, and salted again; where they remain till the vessel is loaded. Sometimes they are cut in thick pieces, and put up in barrels for the conveniency of carriage.

Fishery, *Dry Cod.* The principal fishery for dry cod, is from cape Rose to the bay des Exports, along the coast of Placentia, in which compass there are divers commodious ports for the fish to be dried in. These, though of the same kind with the fresh cod, are much smaller, and therefore fitter to keep, as the salt penetrates more easily into them. The fishery of both is much alike, only this latter is more expensive, as it takes up more time, and employs more hands, and yet scarce half so much salt is spent in this as in the other. The bait is herrings, of which great quantities are taken on the coast of Placentia. When several vessels meet, and intend to fish in the same port, he whose shallop first touches ground, becomes entitled to the quality and privileges of admiral: he has the choice of his station, and the refusal of all the wood on the coast at his arrival. As fast as the masters arrive, they unrig all their vessels, leaving nothing but the shrouds to sustain the masts, and in the mean time the mates provide a tent on shore, covered with branches of trees, and sails over them, with a scaffold of great trunks of pines, twelve, fifteen, sixteen, and often twenty feet high, commonly from forty to sixty feet long, and about one third as much in breadth. While the scaffold is preparing, the crew are fishing, and as fast as they catch they bring their fish ashore; open and salt them upon moveable benches; but the main salting is performed on the scaffold. When the fish have taken salt, they wash and hang them to drain on rails; when drained, they are laid on kinds of stages, which are small pieces of wood laid across, and covered with branches of trees having the leaves stripped off, for the passage of the air On these stages they are disposed, a fish thick, head against tail, with the back uppermost, and are turned carefully, four times every twenty-four hours. When they begin to dry, they are laid in heaps ten or twelve thick, in order to retain their warmth; and every day the heaps are enlarged, till they become double their bulk; and then two heaps are joined together, which they turn every day as before: lastly, they are salted again, beginning with those first salted, and being laid in huge piles, they remain in that situation till they are carried on board the ships, where they are laid on the branches of trees disposed for that purpose, upon the ballast, and round the ship with mats to prevent their contracting any moisture.

There are four kinds of commodities drawn from cod, viz. the sounds, the tongues, the roes, and the oil extracted from the liver. The first is salted at the fishery, together with the fish, and put up in barrels of from 6 to 700 pounds. The tongues are done in like manner, and brought in barrels from 4 to 500 pounds The roes are also salted in barrels, and serve to cast into the sea to draw fish together, and particularly pilchards. The oil comes in barrels, from 400 to 520 pounds, and is used in dressing leather. The Scots catch a small kind of cod on the coast of Buchan, and all along the Murray

Firth on both sides; as also in the Firth of Forth, Clyde, &c. which is much esteemed. They salt and dry them in the sun upon rocks, and sometimes in the chimney. They also cure skait, and other small fish in the same manner, but most of these are for home consumption.

Fishery, *Herring*. Herrings are chiefly found in the North Sea. They are a fish of passage, and commonly go in shoals, being very fond of following fire or light, and in their passage they resemple a kind of lightning. About the beginning of June, an incredible shoal of herrings, probably much larger than the land of Great Britain and Ireland, come from the north on the surface of the sea: their approach is known by the hovering of sea-fowl in expectation of prey and by the smoothness of the water. Herrings are caught in great abundance at the head of Chesapeake bay, about Havre de Grace.

Fishery, *Mackrel*. The mackrel are found in large shoals in the ocean, but especially on the French and English coasts. They enter the English channel in April, and proceeding as the summer advances; about June, they are on the coasts of Cornwall, Sussex, Normandy, Picardy, &c. where the fishery is most considerable. They are taken either with a line or nets: the latter is preferable; and is usually performed in the night-time. They are pickled two ways, first by opening and gutting them, and cramming their bellies as hard as possible with salt, by means of a stick, and then laying them in rows at the bottom of the vessel, strewing salt between each layer. The second way is putting them directly into tubs full of brine, made of salt and fresh water, and leaving them to steep till they have taken salt enough to keep. After this, they are barrelled up and pressed close down.

Fishery, *Pilchard*. The chief pilchard fisheries are along the coasts of Dalmatia, on the coast of Bretagne, and along the coasts of Cornwall and Devonshire. That of Dalmatia is very plentiful: that on the coasts of Bretagne employs annually about 300 ships. The pilchards caught on the British coasts, though bigger, are not so much valued as those on the coasts of France, owing principally to their not being so thoroughly cured. They naturally follow the light, which contributes much to the facility of the fishery: the season is from June to September. On the coasts of France they make use of the roes of the cod-fish, as a bait, which thrown into the sea makes them rise from the bottom, and run into the nets. On the coasts of Great Britain there are persons posted ashore, who, spying by the colour of the water where the shoals are, make signs to the boats to go among them to cast their nets. When taken, they are brought on shore to a warehouse, where they are laid up in broad piles, supported with backs and sides; and as they are piled, they salt them with bay salt, in which lying to soak twenty or thirty days, they run out a deal of blood, with dirty pickle and bittern: then they wash them clean in sea-water, and when dry, barrel and press them hard down to squeeze out the oil, which issues out at a hole in the bottom of the cask. The Cornish men observe of the pilchard, that it is the least fish in size, most in number, and greatest for gain, of any they take out of the sea.

Fishery, *Salmon*. The chief salmon fisheries in Europe are in England, Scotland, and Ireland, in the rivers, and sea-coasts adjoining to the river mouths. Those most distinguished for salmon in Scotland, are the river Tweed, the Clyde, the Tay, the Dee, the Don, the Spey, the Ness, the Bewley, &c. in most of which it is very common about the height of summer, especially if the weather happen to be very hot, to catch four or five score of salmon at a draught. The chief rivers in England for salmon, are the Tyne, the Trent, the Severn, and the Thames. The fishing usually begins about January, and in Scotland they are obliged to cease about the 15th of August, because, as it is then supposed the fish come up to spawn, it would be depopulating the rivers to continue fishing any longer. It is performed with nets, and sometimes with a kind of locks or wears made on purpose, which in certain places have iron or wooden grates so disposed, in an angle, that being impelled by any force in a contrary direction to the course of the river, they may give way and open a little at the point of contact, and immediately shut again, closing the angle. The salmon, therefore, coming up into the rivers, are admitted into these grates, which open, and suffer them to pass through, but shut again, and prevent their return. Salmon are also caught with a spear, which they dart into them, when they see them swimming near the surface of the water. It is customary likewise to catch them with a candle and lanthorn, or wisp of straw set on fire; for the fish naturally following the light, are struck with the spear, or taken in a net spread for that purpose, and lifted with a sudden jerk from the bottom. When the salmon are taken, the method of curing is this, they open them along the back, take out the entrails and gills and cut out the greatest part of the bones, endeavouring to make the inside as smooth as possible, then salt the fish in large tubs, for the purpose, where they lie a considerable time soaking in brine, and about October they are packed close up in barrels, and sent to London, or exported up the Mediterranean. They have also, in Scotland, a great deal of salmon salted in the common way, which after soaking in brine a competent time, is well pressed, and then dried in smoke: this is called kipper, and is chiefly made for home consumption, and if properly cured and prepared, is reckoned very delicious.

[Fishery, *Shad*. The principal fishery for shad are the rivers Susquehannah, Schuylkill, and Delaware in Pennsylvania. Shad fishing begins about the 1st of April at Philadelphia, and lasts till the end of May.—T. C.]

Fishery, *Sturgeon*. The greatest sturgeon fishery is in the mouth of the Volga, on the Caspian sea, where the Muscovites employ a great number of hands, and catch them in a kind of inclosure formed by large stakes, representing the letter Z, repeated several times. These fisheries are open on the side next the sea, and close on the other, by which means the fish, ascending in its season up the river, is embarrassed in these narrow angular retreats, and so is easily killed with a harping-iron. Sturgeons, when fresh, eat deliciously, and in order to make them keep, they are salted or pickled in large pieces, and put up in kegs from thirty to fifty pounds. The great object of this fishery is the roe, of which the Muscovites are extremely fond, and of which is made the caviare or kavia, so much esteemed by the Italians.

Fishery, *Whale*. Whales are chiefly caught in the North Sea: the largest sort are found about Greenland, or Spitzbergen. At the first discovery of this country, whales not being used to be disturbed, frequently came into the very bays, and were accordingly killed almost close to the shore, so that the blubber being cut off was immediately boiled into oil on the spot. The ships in those times took in nothing but the pure oil and the fins, and all the business was executed in the country, by which means a ship could bring home the product of many more whales than she can according to the present method of conducting this trade. The fishery also was then so plentiful that they were obliged sometimes to send other ships to fetch off the oil they had made, the quantity being more than the fishing ships could bring away. Time however and change of circumstances have effected that alteration in the concern which in every similar case it is reasonable to expect. The ships coming in such numbers from Holland, Denmark, Hamburg, and other northern countries, in addition to the English, who were the first discoverers of Greenland, the whales disturbed, and gradually, as fish often do, forsaking the place, were not to be killed so near the shore as before, but are now found, and have been so ever since, in the openings and spaces among the ice where they have deep water, and where they go sometimes a great many leagues from the shore.

The whale fishery begins in May, and continues all June and July; and whether the ships have good or bad success, they must come away and get clear of the ice by the end of August; so that in the month of September, at farthest, they may be expected home; but a ship that meets with a fortunate and early fishery in May, may return in June or July.

The manner of taking whales at present is as follows. As soon as the fishermen hear the whale below, they cry out *fall! fall!* and every ship gets out its long boat, in each of which there are six or seven men: they row till they come pretty near the whale, then the harpooner strikes it with the harpoon. This requires great dexterity, for through the bone of his head there is no striking, but near his spout there is a soft piece of flesh, into which the iron sinks with ease. As soon as he is struck, they take care to give him rope enough; otherwise, when he goes down, as he frequently does, he would inevitably sink the boat; this rope he draws with such violence, that if it were not well watered, it would, by its friction against the side of the boat, be soon set on fire. The line fastened to the harpoon is six or seven fathoms long, and is called the forerunner: it is made of the finest and softest hemp, that it may slip the easier: to this they join a heap of lines of 90 or 100 fathoms each, and when there are not enough in one long-boat they borrow from another. The man at the helm observes which way the rope goes, and steers the boat accordingly, that it may run exactly out before; for the whale runs away with the line with so much rapidity, that he would overset the boat if it were not kept straight. When the whale is struck, the other long-boats row before, and observe which way the line stands, and sometimes pull it; if they feel it stiff, it is a sign the whale still pulls in strength: but if it hangs loose and the boat lies equally high before and behind upon the water, they pull it in gently, but take care to coil it so, that the whale may have it again easily if he recovers strength: they take care however, not to give him too much line, because he sometimes entangles it about a rock, and pulls out the harpoon. The fat whales do not sink as soon as dead, but the lean ones do, and come up some days afterwards. As long as they see whales, they lose no time in cutting up what they have taken, but keep fishing for others: when they see no more, or have taken enough, they begin with taking off the fat and whiskers in the following manner. The whale being lashed along side, they lay it on one side, and put two ropes, one at the head, and the other in the place of the tail, which together with the fins is struck off, as soon as he is taken, to keep these extremities above water. On the off side of the whale are two boats to receive the pieces of fat, utensils, and men that might otherwise fall into the water on that side. These precautions being taken, three or four men, with irons at their feet, to prevent slipping, get on the whale, and begin to cut out pieces of about three feet thick, and eight long, which are hauled up at the capstan or windlas. When the fat is all got off, they cut off the whiskers of the upper jaw with an axe. Before they cut, they are all lashed to keep them firm, which also facilitates the cutting, and prevents them from falling in the sea. When on board, five or six of them are bundled together, and properly stowed, and after all is got off, the carcass is turned adrift, and devoured by the bears, who are very fond of it. In proportion as the large pieces of fat are cut off, the rest of the crew are employed in slicing them smaller, and picking out all the lean. When this is prepared, they stow it under the deck, where it lies till the fat of all the whales is on board; then cutting it still smaller, they put it up in tubs in the hold, cramming them very full and close. Nothing now remains but to sail homewards, where the fat is to be boiled and melted down into train oil.

Besides these fisheries, there are several others both on the coasts of Great Britain and in the North Seas, which, although not much the subject of merchandise, nevertheless employ great numbers both of ships and men; as, 1. The oyster fishing at Colchester, Feversham, the Isle of Wight, in the Swales of the Medway, and in all the creeks between Southampton and Chichester, whence they are carried to be fed in pits about Wevenhoe, and other places.

2. The lobster fishing all along the British channel, the Firth of Edinburgh, on the coast of Northumberland, and on the coast of Norway, whence great quantities are brought to London; and, lastly, the fishing of the pot-ash, fin-fish, sea-unicorn, sea-horse, and the seal or dog-fish, all which are found in the same seas with the whales, and yield blubber in a certain degree; besides, the horn of the unicorn is as estimable as ivory, and the skins of the seals are particularly useful to trunk-makers.

FISHING, the art of catching fish, whether by means of nets and spears, or of lines and hooks. The former are used in fresh and salt waters, for the taking of large fish, which go in shoals; the latter are employed for catching single ones, such as bream, carp, &c. to which we refer. See also ANGLING.

The most important point in fishing is the proper season, together with the place, bait, and mode of application. In March, April, and September, the warmest days are the most successful for this sport, when the bait should be deep; for during those cool months the fish lie near the bottom. For fly-fishing the most proper seasons are the months of April, May, or June, after a gentle shower of rain has beaten the insects down upon the water, without rendering it turbid; and the most promising hours are about nine or ten in the morning, and three or four o'clock in the afternoon; in still, warm evenings, however, fish will readily bite till night approaches; because at those seasons gnats are flying in great numbers.

In the hot days of Midsummer, when the earth is parched up, little success can be expected in any water. Nor will fish bite during cold weather, unless the evenings be warm and serene. The north and east winds are particularly unfavourable to fishing, as well as tempestuous weather in general; but, if a gentle breeze prevail, it will considerably facilitate the operations of the angler. For farther particulars relative to the proper seasons, baits, lines, hooks, &c. for taking fish, we refer the reader to ISAAC WALTON'S *Complete Angler*, 8vo. 1784, where he will find ample instructions blended with considerable amusement.

FISH-PONDS, are those reservoirs made for the breeding and rearing of fish. They are considered to be no small improvement of watery and boggy lands, many of which can be appropriated to no other purpose. In making a pond, its head should be at the lowest part of the ground, that the trench of the flood-gate, or sluice, having a good fall, may, when necessary, speedily discharge the water. The best method of securing the work, is to drive in two or three rows of stakes, at least six feet long, at a distance of about four feet, extending to the whole length of the pond-head, the first row of which should be rammed not less than four feet deep. If the bottom be false, the foundation may be laid with quick-lime; which, slaking, will make it as hard as a stone. Some persons place a layer of lime, and another of earth dug out of the pond, among the piles and stakes; and, when these are well covered, drive in others as occasion may require, and ram in the earth as before, till the pond-head be of the height designed.

The dam should be made sloping on each side, and a waste left to carry off the superabundant water in case of floods or rains; the depth of the pond need not exceed six feet, rising gradually in shoals towards the sides, in order to allow the fish to sun themselves and deposit their spawn. Gravelly and sandy bottoms, especially the latter, are well calculated to promote the breeding of these animals: and a fat soil, with a white rich water, such as the washings of hills, commons, streets, sinks, &c. is said to be the most proper for fattening all sorts of fish.

For storing a pond, carp is to be preferred, on account of its delicacy, quick growth, and prolific nature, as it breeds five or six times a year. This fish delights in ponds that have marl or clay bottoms, with plenty of weeds and grass, on which it chiefly subsists during the hot months.

In a late publication, we meet with the following singular method of furnishing a fish pond with a variety of fish. About the latter end of April, or the beginning of May, take the root of a willow that stands near the water side, and is full of fibres; wash off the earth which adheres to it, then fasten it to a spike, and drive it into a river or pond well stored with fish: they will speedily be induced to deposit their spawn or roe in the fibres of the root. After a few days, (in cool weather, perhaps *weeks*) remove the spike, with the willow root, from the pond, and convey it to that which you design to store, driving it to the depth of four or six inches under the surface of the water; and, in about a fortnight, a great number of young fish will appear. The root, however, should not be left too long in the first pond or river, lest the heat of the sun animate the spawn, and disengage it from the root.

Ponds should be drained every three or four years, and the fish sorted. In those which are kept for breeding fish, the smaller kind should be taken out, for storing other ponds; but a good stock of females, at least eight or nine years old, ought to remain, as they never breed before that age.

FISTULA, in general, denotes any ulcerated and sinuous cavity, with callous and elevated edges, which extends to a carious bone.

This formidable disease is, according to the parts which it attacks, called either *fistula lachrymalis*, that is, a sinuous ulcer of the lachrymal sac or duct, beginning with a tumour between the inner cornea of the eye, and the side of the nose; or a *fistula in perinæo*, namely, an ulcer communicating with the urinary canal, but sometimes opening into the bladder: or *fistula in ano*, when the ulcer is in the vicinity of the rectum or straight gut. The first generally appears in ricketty children, or such as are subject to glandular obstructions; the second may arise from wounds in the bladder and of the urethra, from external violence, &c. but is most frequently occasioned by certain diseases with which voluptuaries are punished; and the last is produced by whatever tends to form matter about the anus, by piles, soft tumours, hardened feces, or in consequence of irritation and inflammation, terminating in suppuration.

It would be needless to enlarge upon the treatment of this complaint, the cure of which cannot be entrusted to unskilful hands; nay, medical and surgical advice of the best kind that can be procured, should be sought for without delay.

FITS of easy reflection, &c. in optics. Sir ISAAC NEWTON calls the successive disposition of a ray to be reflected through different thicknesses of a plate of air, or any other substance, the returns or fits of easy reflection; and the disposition of the same ray to be transmitted in the same manner through the intervening spaces, returns or fits of easy transmission. Thus, a ray of light is in a fit of easy reflection, when it falls on a plate of any kind of matter, whose thickness is one of the terms of the series 1, 3, 5, 7, &c. taking the smallest thickness capable of reflecting such ray for unit; and, in the same way, it is in one of its fits of easy transmission when the thickness is one of the terms of the series 2, 4, 6, 8, &c. See OPTICS.

FIXED-AIR, the gas now called carbonic acid.

Fixed air was first discovered by Dr. BLACK, who, in consequence of various experiments, found that chalk, and the other earths reducible to quick-lime by calcination, consist of an alkaline earth, combined with this gas. He observed the same of magnesia and alkalis, both fixed and volatile. Their effervescence with acids, and their mildness, depend on the fixed air or carbonic acid which these bodies contain; because alkalis and calcareous earths become in a high degree *caustic*, when divested of that gas. He farther remarked, that *fixed air* had different degrees of affinity with various substances; being stronger with calcareous earth than with fixed alkali; with the latter than with magnesia; and with this than with volatile alkali.

[One of the best of all medicines for gravelly and gouty complaints and indigestion, is 15 or 20 grains of soda or of potash taken twice a day in a glass of seltzer water.—T. C.]

FLAGEOLET, a little flute, used chiefly by shepherds and country people. It is made of box, or other hard wood, and sometimes of ivory, and has six holes besides that at the bottom, the mouth-piece, and that behind the neck.

FLAIL, an instrument for threshing corn. A flail consists of the following parts: 1. the hand-staff, or piece held in the thresher's hand; 2. the swiple, or that part which strikes out the corn; 3. the caplins, or strong double leathers, made fast to the tops of the hand-staff and swiple; 4. the middle band, being the leather thong, or fish-skin, that ties the caplins together.

FLAMBEAU, a kind of large taper, made of hempen wicks, by pouring melted wax on their top, and letting it run down to the bottom. This done, they lay them to dry; after which, they roll them on a table, and join four of them together by means of a red-hot iron; and then pour on more wax, till the flambeau is brought to the size required. Flambeaus are of different lengths, and made either of white or yellow wax.

FLAME. Simple ignition never exceeds in intensity of light the body by the contact of which it is produced: but flame consists of volatile inflammable matter, in the act of combustion, and combination, with the oxygen of the atmosphere. Many metallic substances are volatilised by heat, and burn with a flame, by contact of the air in this pure state. Sulphur in the act of inflammation is volatilised, and in that state it unites with the oxygen of the air, and forms SULPHURIC acid, which see.

FLANNEL, a kind of light, porous, woollen stuff, woven on a loom with two treddles, in a manner similar to baize.

This is unquestionably one of the most useful articles of wearing apparel; and it is much to be regretted, that it is not more generally worn, as we are fully persuaded, that it would be the means of preventing many diseases.

The principal objection to the wearing of flannel appears to be, that it irritates the skin, and occasions disagreeable sensations:—these, however, continue only for a few days, and the subsequent advantages, thence resulting, amply compensate for such temporary uneasiness. Both young and aged would derive from it equal advantages.—We do not, however, mean to insinuate, that flannel next the skin should be *universally* and indiscriminately worn by infants and young persons; though it is an ill-founded assertion of its adversaries, that it has a tendency to produce eruptions; as it evidently opens the pores, promotes perspiration, and thus removes the principal *cause* of cutaneous diseases that originate from an obstructed and irregular state of the skin.

There are, however, certain cases in which *flannel* cannot, with strict propriety, be used as an under dress. In order to enable the reader to ascertain whether its constant use be advisable or not, we shall point out the leading circumstances which may, in this respect, influence his determination: it is a *salutary* dress to all those, in general, who have passed the meridian of life, or the 35th year of their age; though they should not have been accustomed to it from their infancy; to persons of a cold and phlegmatic habit, or leading a sedentary life; to such as are subject to fits of the gout, rheumatism, frequent colds and catarrhs; to individuals very susceptible of impressions connected with the vicissitudes of air, weather, and climate; as well as to nervous patients, and those who have recently recovered from severe chronical diseases.—On the contrary, the wearing of flannel next the skin may be *injurious* to constitutions so organised that they are liable to profuse perspiration, on taking even moderate exercise; or to those who are already afflicted with scorbutic or other eruptions of the skin; or, lastly, to all such irritable and whimsical persons as possess neither bodily nor mental vigour sufficient to overcome the first uneasy sensations which it occasions. But we are fully warranted to assert, from daily experience, that the habitual use of this beneficent texture has essentially contributed to the recovery of numberless ricketty children, not less than to the saving of others who were born of feble and enervated parents. In short, there is every reason to believe, that a *more general* adoption of this salutiferous cloth might prevent many fatal inflammations of the throat, breast, lungs, &c. to which the poorer class of people are remarkably liable; and thus preserve the lives of multitudes who now become a prey to our damp and variable climate. [Good advice.—T. C.]

FLATULENCY, a very common disorder, arising from vapours generated in the stomach and intestines. It occasions distensions, disagreeable sensations, and frequently a considerable degree of pain. [It is the general effect of indigestion, and of hysteric complaints. Persons afflicted with it, should abstain from much vegetable food, from melted and toasted butter, from all greasy dishes, from new and acid bread, and acid food and drink. —T. C.]

FLATS, in music, a kind of additional notes, which, together with sharps, serve to remedy the defects of musical instruments, wherein temperament is required.

FLAX, is the produce of an annual plant, (*Linum usitatissimum*,) with spear shaped leaves, and blue flowers, which is cultivated in several parts of this country, and grows wild in corn-fields and sandy pastures.

The stems of these plants rise to the height of about two feet. The seed vessels and leaves of the calyx are sharp pointed. The flowers have each five scolloped petals

It is supposed that this plant was originally introduced into Great Britain from those parts of Egypt which are annually inundated by the Nile. Its utility is incalculable. To it we are indebted for the linen we wear, for our sheets, table-cloths, and numerous other indispensable articles; and although cotton might, in some measure, supply its place, those persons who have been accustomed to the comforts of linen would be little desirous of the exchange.

The cultivation of flax is pursued to considerale extent in some parts of the British dominions. The seed imported from Riga and Holland is generally esteemed the best, though this is believed to be mere matter of opinion. It is sown in March or April; and the plants, when nearly ripe, are pulled up by the roots. These, if flax and not seed be the object of the crop, are either placed in small parcels upon the surface of the land, for exposure to the sun, to dry; or they are immediately conveyed to the place where they are to undergo the process called watering. For this purpose they are loosely tied in small bundles, placed in pools or ponds of soft and stagnant water, and allowed to continue there several days. By the fermentation which takes place the bark or flaxy substance becomes separated. They are then taken out, and thinly spread upon the grass, in regular rows. Here they are occasionally turned until they have become so brittle that, on being rubbed between the hands, the flax easily and freely parts from the stalks. They are then taken up, and bound in sheaves to be either sent to a mill, or to be broken and scuttled, as it is called, by a machine contrived for that purpose.

The flax, by the above process, having been separated from the stalks, it subsequently undergoes various dressings, according to the purposes for which it is to be used.

When the plants have been grown for *seed*, they are pulled as before, and then laid together by handfuls upon the ground, with the seed ends towards the south. The next operation is to force off the seed vessels, (*rippling*.) For this purpose a large cloth is usually spread on some adjacent and convenient spot of ground, and an instrument, called a ripple, is placed in the middle of it. This is a sort of comb, consisting of six, eight, or ten, long, triangular, upright teeth. The seed ends of the flax are pulled repeatedly through the teeth of the comb, by which the parts containing the seed are removed from the stalks. After this the pods and seeds, which have the name of *lineseeds*, are spread upon a cloth in the sun to dry, and subsequently are threshed, sifted, winnowed, and cleansed. The best seed is generally preserved for sowing, and the second sort yields considerable profit in the oil called *linseed-oil*, which is obtained from it by pressure. This is equally useful in the arts and in medicine. It is occasionally used for making the soap called green soap; and, if heat be applied during the pressure of the seeds, it attains a yellowish colour and a peculiar smell, and in this state is used by painters and varnishers. An infusion of the seed, in the manner of tea, is recommended in coughs; and from the seed is also made an easy and useful poultice for external inflammations.

After the oil has been expressed, the remaining farinaceous part of the seeds is squeezed together into large masses, called *oil-cake*, which is given as food to oxen.

It must be remarked that the water in which flax has been macerated becomes thereby poisonous to cattle; and on this account the practice of steeping it in any running stream or common pond was prohibited by an act of Parliament, in the reign of Henry VIII.

The following directions for cultivating flax are given by Mr. DEANE, in his *New England Farmer*.

"Flax requires more care and nicer culture than any that we are concerned with. It should never be sown on a soil that is not rich, and well wrought.

Sandy and gravelly soils are by no means suitable for flax. It is not a plant that requires much heat; therefore it answers well in cold latitudes. The cooler kinds of soil, such as clay and loam, and the black earth of drained lands are suitable for it. But they should be well pulverised and manured. In wet seasons it commonly does better than in dry ones: So that though it may sometimes do well upon high land, it is best not to run the risk of it, but rather choose a soil that is naturally low and moist. If it be too wet, some little trenches may be made, thirty or forty feet asunder, to drain off the water. The land must be in good heart, either naturally, or by the help of manures. But new dung should not be laid on it at the time of sowing; nor any thing else that will make weeds increase; for in no crop are weeds more pernicious than in flax. It is often found that they entirely kill most of the plants; and the remaining ones will be bushy and mis-shapen, and have a weak coat on them, being too much deprived of the rays of the sun.

The manure for flax ground should rather abound with oils than otherwise, and be rather cooling than hot. The old rotten dung of black cattle and swine is most suitable, or a compost in which these dungs are the principal parts. A top-dressing of sea-weeds, after the flax is come up, is greatly recommended. But I rather choose to enrich the ground a year before, than when the flax is sowed. A crop of potatoes is good to precede one of flax. I plough up green sward, and dung it well with such manures as are suitable for flax, and plant it with potatoes. This crop does not abate the strength of the soil, but rather increases it. It makes the ground mellow, and does not encourage weeds: it is therefore in fine order for flax the year following.

Green sward will sometimes do well the first year; but it must be a fat deep soil, such as some intervales are, and should have a dressing of old dung, well pulverised, and mixed with the soil by harrowing: for if it be not well mixed, the crop will be of various lengths, which is inconvenient, and occasions loss.

In England they sow two bushels of imported seed on an acre. When they sow seed of their own growing they allow more. In this country some afford but one bushel. The best quantity may be about six or seven pecks, or a little more or less, according to the strength of the soil. For it is not with this crop as some say it is with grain. Of grain, rich land requires, they say, less seed; because what is wanting in seed, is made up in stooling. But however this may be, it is most certain that the stooling of flax will be hurtful. That is the best flax, where a root bears but one spire, or stalk. It will be straighter and taller, as well as more soft and pliant. The ground should be ploughed in the fall, and again in the spring, the clods broken, and the stones taken out.

Flax should be sowed early, unless the soil be too wet. A small degree of frost, happening after it is up, will not kill it. That which is sowed early, has the strongest coat, as it is slower in its growth.

A calm time should be taken to sow the seeds: otherwise it cannot be sowed even, it being more difficult to sow than most other seeds.

Flax-seed should be changed once in two or three years, or it will so degenerate, as to be unfit for sowing. It is worth while to change it every year. It is certain, that seed from less than a hundred miles distance, has been known to make a crop more than double. It has done so in this country. After the seed is sown, it should be covered, either by bush-harrowing or by rolling, or both.

When flax comes to be about four inches high, if weeds appear among it, they should be pulled up by careful hands: And to prevent wounding the flax, the weeders should be bare-footed. If they should tread it down at this age, it will soon rise up again. The weed commonly known by the name of false flax, is not in blossom till the flax is nine inches, or a foot high. At this time the weed is easily found by its blossoms; and what escaped at the first weeding, should at this time be carefully eradicated.

The next operation in the culture of flax, is pulling it: in doing which, care should be taken not to mix long and short together in the same hands, but to keep all of the same length by itself. The reason of which caution is so obvious, that I need not mention it.

The time of pulling flax depends upon its growth and ripeness, and upon the proposed method of managing it afterwards.

That which is to be watered, should be pulled as soon as the blossoms are generally fallen off. Some think the harl is stronger at this time than afterwards, as none of the oily particles are yet passed up into the seed. It is undoubtedly better for the soil, that it be pulled at this time, than when the seed is ripe. The longer it stands to ripen, the more oily particles it will draw from the earth.

Being pulled, and tied up in hands, the flax should be put into the water without delay. A pond is preferable to running water, both as it is warmer, and not so apt to deprive the flax of its oily and glutinous substance. In four or five days, according to the warmth of the water, it will be time to take it out. But that the true time may not be missed, it must be carefully watched, and trials made by drying and breaking a little of it, that so the harl may not get too much weakened.

After it is taken out, and has lain dripping a few hours, it must be spread on a grassy spot, and dried. If it should happen to be not watered enough, the want may be made up by letting it lie in the dews for a few nights; and if a gentle rain happen to fall on it, it will be the whiter and cleaner.

The flax that goes to seed should not stand till it appears brown, nor till the seed be quite ripe. It is not necessary on account of the seed; because it will ripen after pulling. When the leaves are falling from the stalks, and the stalks begin to have a bright yellow colour, the bolls just beginning to have a brownish cast, is the right time for pulling.

The rind is to be loosened from the stalks, not by watering, lest it be too harsh, but by spreading it on the grass to receive the nightly dews. When it is done enough, the rind will appear separated from the stalk at the slender branching parts near the top ends. When it is almost done enough, it should be turned over once or twice.

It was formerly the practice, after drying the flax in the field, to house it till some time in September; and then to beat off the seed and spread the flax. But this often interfered with fall feeding: And it was necessary it should lie the longer, the weather being cool. Sometimes it has been overtaken by snows.

I prefer the method I have lately gone into, as it saves labour; which is to spread the flax as soon as it is pulled. I do it on a spot where the grass is not very short, which prevents sunburning. As the weather is hot, it will be done in about ten days or a fortnight. I then bundle and beat the seed off, and lay it up in a dry place till winter. While it lies, most of the seed will shell out.

In the most frosty weather it will dress easily without warming before a fire, or baking it in an oven. The *Complete Farmer* describes and represents machines for breaking and scutching flax.

To prevent the ill effect of so severe a crop as flax is to the soil, it should be ploughed without delay after the crop is taken off. As flax is pulled early, the ground thus gets a kind of summer fallow, which will do much towards recruiting it, and weeds are prevented from going to seed."

FLAX, TOAD, the COMMON YELLOW,

or *Antirrhinum Linaria*, L. an indigenous perennial plant, which grows in barren meadows, pastures, and road sides, and is in flower from July to September.

Cows, horses, and swine, refuse this noxious weed; nor is it relished by sheep and goats.

This detestable weed, which is known in Pennsylvania by the name of *Ransted*, is said by our botanists not to be a native of the United States. Did the importer of it know the injury he has done by its introduction, he could not fail to regret the pains he took on the occasion.

Ransted abounds in an acrid oil. The juice mixed with milk is a poison to flies. The distilled water or juice of the plants, used as a cataplasm, is an approved remedy for the piles, according to RAY, HALLER, and CURTIS.—(? T. C.)

It is highly injurious to grass lands.

FLEA, or *Pulex*, L. in zoology, a genus of insects requiring no particular description.

Want of cleanliness remarkably contributes to the generation of fleas; as the females deposit their eggs, each from twenty to thirty, in damp and filthy places, within the crevices of boards, on rubbish, &c. whence they emerge in the course of six or eight days, in the form of greasy whitish maggots. When a fortnight old, they envelope themselves in a small chrysalis, from which they sally forth, after ten days existence, in the form of fleas.—In the winter, these different transformations require a period of six weeks, but in summer only a month. They probably do not live longer than *one* year; though it is said, that fleas have been kept on little golden chains for *six* years. As they are able to draw a weight eighty times greater than that of their own bodies, some frivolous persons have occasionally kept them harnessed to miniature carriages, &c. Leaping also is a singular proof of their muscular strength; as, by pressing the belly downwards, expanding their legs, and then suddenly contracting them, these creatures dart forward to a distance of 10 or 12 inches.

Children and females are remarkably liable to the attacks of this little enemy; a circumstance which must be attributed to their more tender skin, their purer blood, longer clothes, and, in some individuals, perhaps, to a peculiar state of perspiration. Cleanliness, and frequent sprinkling of the room with a simple decoction of wormwood or sassafras, will soon extirpate the whole breed of these troublesome vermin; and the best remedy to expel them from bed-clothes, is a bag filled with *dry moss*, the odour of which is to them extremely offensive. Others cover the floors of the rooms where fleas abound, with the leaves of the alder tree, while the dew is on the foliage, to which these insects fondly adhere, and thus may be easily destroyed.—Fumigation with the leaves of pennyroyal, or the fresh-gathered foliage of that plant, sewed up in a bag, and laid in the bed, are also remedies pointed out for the expulsion of fleas. [Sprinkle with camphorated whiskey or other ardent spirit.—T. C.]

Dogs and cats may be effectually secured from the persecutions of these vermin, by occasionally anointing their skin with sweet oil. [The fleas and lice of poultry are destroyed by decoction of sassafras wood.—T. C.]

FLESH, the muscular part of an animal body, in which the blood-vessels are so small as to retain only blood enough to give them a red colour.

FLESH-MEAT, or the flesh of animals prepared for food, is an important object of domestic economy. In this place, however, we shall communicate only the most proper and effectual ways of preserving such meat in a fresh state, especially in the hot days of summer, as we treat of its relative salubrity and influence on health, under distinct heads.

[Meat can be preserved fresh in hot weather, 1. By covering it with fresh charcoal powder in a cool cellar. 2. By covering it with molasses. 3. By keeping it in a vessel wherein carbonic acid gas has excluded the common air. 4. By folding it in a cloth dipt in vinegar wherein pepper has been infused. 5. By wiping it dry, and enveloping it in melted suet.—T. C.]

Under the article BEEF, in the first vol. ample directions were given for salting beef. The following additional account of the result of a successful trial to preserve beef, killed in very hot weather, in August, will be found useful.

[The animal fasted a night and day before being killed. About nine o'clock in the evening he was killed, and cut up immediately. At 4 A. M. every piece was quickly wiped, rubbed with finely pounded salt, and instantly put into a barrel in a cool cellar. The next night the pieces were taken out, drained for half a minute, put into another barrel, and the following pickle was poured on them *boiling hot:*

To every two gallons of water were added 40 oz. of salt, and 3 oz. of saltpetre. This was poured on boiling hot, 1st. to kill the egg of any fly-blows: 2dly, to corrugate the external fibres of the meat where it is first apt to taint.

N. B. The meat was deprived of all the large bones.

In about a week the meat was taken out of pickle; the pickle boiled and scummed, and again poured on hot.—The meat kept perfectly well.

The pickle of meat should be often examined, and once a fortnight boiled and scummed.

The above proportions of 20 oz. of salt and 1½ oz. of saltpetre to the gallon of water, is the best proportion for pickling meat for family use.—T. C.]

FLEUK-WORM, or **FLEWK-WORM**, *Fasciola hepatica*, L. an insect, of the size and shape of a child's finger-nail: it creeps up the gall-ducts from the intestines, and, preying upon the livers of sheep, occasions coughs and consumptions in those animals.

Sheep, pasturing in moist grounds, are frequently attacked by this insect, which Dr. DARWIN conjectures to arise from the bile becoming too much diluted, in consequence of their watery food; so that it does not possess sufficient acrimony to prevent the depredations of fleuk worms.

The remedy in general prescribed, is to dissolve one ounce of salt in water: but Dr. DARWIN suggests, that the salt may be used with greater advantage, if hay were moistened with the solution, which would thus supply more wholesome nourishment, than is usually given to sheep troubled with these vermin.

FLINT, an opaque stone, found in chalk and also in lime stone: of a smooth uniform texture, and so hard, as to emit fire, when stricken against steel. It is used in the manufacture of glass and pottery For this purpose, the hardest flints are selected, and calcined. After cleaning them of the ashes, the flints are finely pulverised and sifted. When intended for glass, they are sometimes washed in diluted muriatic acid, and then left to subside; after which the liquor is to be poured off, the powder washed several times with hot water, and, lastly, dried.

FLOAT-BOARDS, those boards fixed to water-wheels of under-shot mills, serving to receive the impulse of the stream, by which the wheel is carried round. See MILL.

FLOOR, in architecture, the area, or lower part of a room, which is in general covered with boards, of white or yellow pine.

[It is said that the Lombardy poplar is set on fire without difficulty. On the continent of Europe floors are usually made with plaister, or with small tiles well fitted and jointed, and painted. This is a much more sensible practice than using boards of any kind, and ought to be adopted.—T C.]

FLOUNDER, or *Pleuronectes flesus*, L. a fish which abounds in all parts of the British sea, and is also found in rivers, at a considerable distance from the shore. It may be easily distinguished from plaise, or any other fish belonging to the genus, by a row of small, but sharp spines, which surround its sides, and are placed at that part where the fins are united to the body: a similar row marks the side-line, and extends half way down the back. The upper part of the body is of a pale brown, which is sometimes marked with a few spots of greasy yellow.

Flounders seldom grow to any size in the rivers, few exceeding the weight of five or six pounds; they are, however, preferred to those which are caught in the sea; being much sweeter, and at the same time having a more delicate flavour.

FLOUR, the meal of wheat, rye, &c. finely ground and sifted; and consists chemically of gluten, starch and mucilage in various proportions. It is subject to the depredations of insects of an oblong, slender form; their heads are provided with a kind of proboscis or snout, with which they take in their food; their body is composed of several rings. They do incalculable damage to the flour deposited in magazines for armies or other public uses; and after they have insinuated themselves into any parcel, the only method that can be adopted for saving the whole quantity is, to convert it immediately into bread.

To prevent such noxious vermin from breeding in flour, it should be kept thoroughly *dry*, as well as the barrels into which it is packed. Sometimes, however, it happens, that though every attention be bestowed on it, flour becomes *sprit*, or damaged, and thus acquires an unpleasant flavour. This may be remedied by mixing a quantity of ground rice (in the proportion of one pound to ten of flour) with the usual quantity of yeast and water; keeping the mixture before the fire for the space of two hours; at the expiration of which time, the whole may be wrought into bread, in the common manner: thus it will be totally divested of its disagreeable flavour, or better by adding 25 grains of magnesia to each lb. of the flour.

The proportion of flour, which a bushel of grain affords, greatly varies. A bushel of Essex wheat, Winchester measure, weighs upon an average about 60 lbs. which, when ground, will yield (exclusive of the loss incurred by the grinding and drying) 45½ lbs. of the flour called *seconds*, which alone is used for baking throughout the greater part of England, and which affords the most wholesome, though not the whitest bread. Beside the *seconds*, such a bushel of wheat yields 13 lbs. of pollard and bran: the total loss in grinding seldom exceeds one pound and a half.

A correspondent of the Editors of the *Encyclopædia Britannica* (Article BREAD,) states, that he weighed two bushels, Winchester measure, of *white* and *red* wheat, the whole of which amounted to 122 lbs. This wheat was ground under his own inspection, and yielded 121½ lbs. of meal, so that the waste or loss in grinding the two bushels, amounted only to *half* a pound.—The meal was also dressed in his presence, and produced 93½ lbs. of *seconds*, and 25½ lbs. of pollard and bran, so that the whole loss in the two bushels, both by grinding and dressing, did not exceed two pounds and a half. The bran and pollard were also dressed in a bolting mill, and produced,

	lbs.	*oz.*
Sharps - - -	6	0
Fine Pollard - -	5	8
Coarse ditto -	7	8
Broad Bran -	5	3
	24	8

One pound only was thus lost in the bolting, and if the sharps had been sifted, they would have afforded three pounds of good flour. We are inclined to think, from these and similar data, if the price of wheat were given, that of flour might be easily ascertained, and those frauds which are now practised with impunity, could be effectually prevented.

FLOWER, or *Flos*, the most beautiful part of the plants and trees, which contains the organs of fructification.—See BOTANY.

From their frequent utility as medicinal drugs, as well as their external beauty, the *preservation of flowers* becomes an object of some importance. For this purpose, various methods have been devised, from which we select the following, originally suggested by Sir JOHN HILL: Let a sufficient quantity of fine sand be washed, so as completely to separate all extraneous matter. It is next to be dried, and sifted in order to cleanse it from the gross impurities that would not rise in washing. The flower or plant intended to be preserved, should then be gathered with a convenient portion of the stalk, and deposited in an earthen vessel adapted to its size. A small quantity of the sand, prepared as above directed, is next to be heated, and laid on the bottom of the vessel, so as to cover it equally, and the plant or flower placed on such sand, so as to touch no part of the vessel.—More sand is then to be sifted over, that the leaves may gradually expand, without receiving any injury, till the plant or flower is covered to the depth of two inches. The vessel is now to be placed in a stove, or hot-house, heated by gradations to the 50th degree of REAUMUR, or about 144 deg. of FAHRENHEIT, where it should stand for one, two, or more days, in proportion to the thickness or succulence of such plant or flower. At the end of that time, the sand may be gently shaken off on a sheet of paper, and the plant carefully taken out, when it will be found in all its beauty; its shape being as elegant, and its colours as vivid, as when it was growing in a natural state. [? T. C.]

There are some flowers, especially tulips, which require certain little operations, in order to preserve the adherence of their petals. With respect to these, it will be necessary to cut the triangular fruit that rises in the middle of the flower, previously to covering it with sand; for the petal will then remain more firmly attached to the stalk.

This method may be applied to such plants and flowers as are employed in medicine: for, though it be not always necessary to preserve their original colour and form, yet the less change they undergo, the better will they retain their natural properties. Farther, the preservation of beautiful leaves and flowers in their original shape and colour, by placing them in such a situation that they may suffer no subsequent alteration, except that from length of time or accident, is surely an object that merits the attention of every lover of Nature. See HERBAL.

Besides this mode of preserving flowers, they may be prepared so as to retain their beauty during the winter, and even to blow at any period required

In order to succeed in this attempt, the most perfect buds of the flowers should be selected at the time when they are about to open. These should be cut off with a pair of scissars, leaving to each a piece of the stem about three inches in length; the end of which is immediately to be covered with Spanish wax. As soon as the buds are somewhat shrunk and wrinkled, they are to be folded up, separately, in a piece of clean dry paper, and deposited in a dry box or drawer, where they will keep without decaying.—In the winter, or whenever the flowers are required to blow, the wax is to be cut off the buds, and these should in the evening be immersed into water, in which a little nitre, or common salt, has been dissolved: if exposed to the rays of the sun, on the succeeding day, they will expand with all their original fragrance and beauty.

There are a few general remarks made by eminent botanists, on the *growth, enlargement, colours,* and *duplication of flowers*; the substance of which we shall communicate under the following heads:

1. It is an established fact, that flowers as well as fruits grow larger in the shade, and ripen and decay soonest, when exposed to the sun. Hence, likewise, the foliage or buds of plants requires more moisture for its vigorous growth than their flowers, or organs of fructification. Farther, observes Dr. DARWIN, the frequent rains of our climate, are apt not only to wash off the farina from the bursting anthers, and thus to prevent the impregnation of the pistil, but also to delay the ripening of the fruit or seeds, from the want of a due evaporation of their perspirable matter, as well as from the deficiency of solar light in cloudy seasons. In another place of his admirable "*Phytologia*," this philosopher remarks that, as a superfluous supply of water is more friendly to the growth of leaf-buds, than to the generation of flower-buds, the production of seeds may be forwarded by supplying their roots with less water than usual. But when the blossoms appear, an addition of water promotes their growth, by affording nourishment, which should again be lessened, when the fruit has acquired its full size, both to promote its maturity and improve its flavour; as the saccharine matter and essential oil will thus be in a less diluted state.—Although the fruit may become sweeter and larger, when the green as well as the floral leaves continue on the tree, yet the corols with the stamens, stigmas, and nectaries (the succeeding fruit not considered) suffer, in the opinion of Dr. DARWIN, no injury when both kind of leaves are removed, as by the depredations of insects. Nay, some florists assert, that the flowers thus become stronger, producing no bulbs, as is the case with tulips and hyacinths.

2d. The variegated *colours* of the petals of flowers are so beautiful, and afford such a delight to the eye of the contemplative naturalist, as to deserve some investigation. It is probable that *varieties* in the colours of single flowers raised from seeds, may be generally obtained by sowing those which already possess different shades, contiguous to others of the same species; or, by bending the flowers of one colour and shaking the anther-dust over those of another. Thus Dr. DARWIN supposes the beds of the corn blue-bottle, *centaurea cyanus*, acquire those beautiful shades of blue, purple, and white. As some animals change their natural colours, when transplanted in different situations of soil, a similar effect may be produced by sowing flowers in factitious composts, which considerably differ from each other with respect to vegetable nutriment, and perhaps also in their colour. Experiments on this subject, as well as on the variegation of the leaves of shrubs and trees, are however wanting to confirm this conjecture; though the latter probably originates from soil or situation, and may be communicated by ingrafting. The origin of new colours in flowers, and of variegated foliage, is imagined to arise from the want of nourishment of the soil on which they grow, compared to that assigned to them by Nature; or from a defect of moisture and of heat: a supposition countenanced by the dwarfish size of such plants, in general, and especially by the reduced stature of tulips, when their petals acquire various colours.

The immediate cause of the various colours presented by some flowers, such as poppies, has not hitherto been distinctly ascertained; but Dr. DARWIN conjectures that, as they are not variable by the obliquity with which they are seen, like those of mother-pearl, card-fish, &c. they do not depend on the thinness of their pellicle, and may, therefore, arise from the greater facility which some parts of vegetables, more than others, possess in parting with their *oxygen* when exposed to the sun's light; for all flowers are more or less blanched before they first open.

3. The origin of *double flowers* is believed to result from the luxuriant growth of the plant, in consequence of excessive nourishment, moisture, and warmth: they arise from the increase of some parts of the flower, and the consequent exclusion of others. As they present a greater blaze of colour in a small space, and continue in bloom for some weeks longer than single flowers, the method of producing them from seeds is a matter of importance. Botanists very properly term such multiplied flowers *vegetable monsters*, because they possess no stamens or pistils, and therefore can produce no seeds. Nevertheless they are frequently raised from seeds; because flowers cultivated with more manure, moisture, and warmth, than is congenial to them, not only grow larger and more vigorously, but likewise show a tendency to become double, by having one or two supernumerary petals in each flower, such as the stock July flower, cheiranthus, and anemone. It is still more remarkable, that this duplicature is communicated to those individual blossoms: hence florists tie a thread round such flowers, to mark them, and to collect their seeds separately, from which double or full flowers are said to be uniformly produced, if they be cultivated with additional manure, moisture, and warmth, as has been already observed. There subsists a curious analogy, concludes Dr. DARWIN, between these vegetable monsters and those of the animal world; for a duplicature of limbs frequently attends the latter, as chickens and turkeys with four legs and four wings, and calves with two heads. In mules, also, the most important organs become deficient, so that they cannot propagate their species; exactly analogous to these full flowers which, from the same cause, produce no seed. With respect to botanic systems, it may be observed from these vegetables of exuberant growth, that the stamens and pistils are less liable to change than the corols and nectaries; consequently, that they are more proper parts for arranging plants into classes; and that on this idea LINNÆUS constructed his unrivalled system. Lastly, the calyx, or perianth, being seldom found in a double or multiplied state, is the next part of a flower that is liable to the least changes; and may, therefore, on accurate inspection, serve to detect the genera of many double flowers.

With respect to the colours which may be extracted from flowers, we refer the reader to the article COLOURING MATTER, and to the different flowers as they occur in their alphabetical order.

FLOWER-DE-LUCE, or FLAG, *Iris*, L. a genus of plants consisting of 54 species, the following three of which are natives of Great Britain:

1. The *pseudacorus*, WATER FLOWER-DE-LUCE, or Yellow Flag; which is perennial, grows on the banks of rivers, in marshes and wet meadows, and produces large yellow flowers in the month of July. The leaves of this plant, when fresh, are eaten by goats, and when in a dry state, by cows, but they are refused by horses and hogs. On account of its poisonous nature to all cattle, except sheep, this vegetable ought to be carefully extirpated from the meadow-grounds and their contiguous ditches. We may recommend the whole of this strongly astringent plant to the *tanner*; and its flowers to the *dyer*, for extracting a beautiful yellow; but the root, in particular, as a substitute for galls in preparing a black dye, or ink, with vitriol of iron.

1. The *fœtida*, STINKING FLOWER-DE-LUCE, Gladwyn, or Flag, which is found on hedge-banks, and sloping grounds, particularly in the south-western counties of England: it is perennial, and produces flowers of a purplish ash-colour, which lose their smell during the night, and blow in the months of June and July. This plant is refused by horses, sheep, and goats; its leaves are very fetid, and, when bruised, smell like rancid bacon. The juice of the roots of this, as well as the preceding species, have occasionally been used to excite sneezing; which is a dangerous practice, and has sometimes been attended with violent convulsions. It may, therefore, be more usefully employed for the destruction of bugs and other vermin.

3. The *Xiphium*, or BULBOUS-ROOTED FLOWER-DE-LUCE, or Flag, which has long been cultivated in our gardens, on account of its beauty. M. SCHULZE informs us in his "*Social Narratives*" (in German), that he made the following experiments with the azure-blue flowers of this neglected plant: He first bruised the flower-leaves in a marble mortar, expressed their juice, collected it in a shallow glass vessel, and, after adding a small portion of finely-pulverised alum, he suffered it to dry under shade in the open air: thus, he obtained a very beautiful *green pigment*. The flowers, however, should be gathered in dry weather, their white parts carefully separated from the co-

loured leaves, and the pounded alum gradually mixed with the juice, till the desired colour becomes perceptible. With this preparation, both linen and silk were dyed of a remarkably fine and permanent green colour Professor Gmelin, in his German "*Technical Chemistry*," gives the following recipe for preparing a lively *green water-colour:* Take equal quantities of the expressed juice of the bulbous-rooted flag and rue, and add such a proportion of a strong solution of alum, as is required to produce the colour.

FLOWERS, in chemistry, a term formerly applied to a variety of substances procured by sublimation, and were in the form of slightly colouring powder.

FLUATES, in chemistry, salts of which the fluoric acid is the chief ingredient. The chief properties of these salts are, 1. When sulphuric acid is poured upon them, they emit acrid vapours of fluoric acid, which corrode glass. 2. When heated, several of them phosphoresce. 3. They are not decomposed by heat, nor altered by combustibles. 4. They combine with silica by means of heat.

FLUID, in physiology, an appellation given to all bodies whose particles easily yield to the least partial pressure, or force impressed.

The nature of a fluid, as distinguished from that of a solid, or hard body, consists in this, that its particles are so loosely connected together, that they readily move out of their places, when pressed with the least force one way more than another; whence philosophers have concluded, that these particles are exceedingly minute, smooth, and round, it being otherwise impossible they should move with such freedom upon the least inequality of pressure.

Those particles, considered separately, are endowed with all the common properties of matter, and are subject to the same laws of motion and gravitation with larger bodies. To inquire, therefore, into the nature of fluids, is to consider what appearances a collection of very small round bodies, subject to these laws, will exhibit under different circumstances.

FLUIDS, Motion of. The motion of fluids, viz. their descent or rise below or above the common surface or level of the source or fountain, is caused either, 1. By the natural gravity or pressure of the fluid contained in the reservoir, or fountain; or, 2. By the pressure or weight of the air on the surface of the fluid in the reservoir, when it is at the same time either taken off or diminished on some part in aqueducts, or pipes of conduit 3. By the spring or elastic power of compressed or condensed air, as in the common water engine. 4. By the force of pistons, as in all kinds of forcing pumps, &c. 5. By the power of attraction, as in the case of tides, &c.

FLUMMERY, a kind of jelly made of oatmeal, in the following manner: Steep three large table spoonfuls of finely ground oatmeal for 24 hours in two quarts of pure water, then pour off the clear fluid, and replace it by three pints of fresh water: add to it two spoonfuls of orange flower-water, and one of sugar; boil the whole to the consistence of a hasty pudding, stirring it continually while boiling, till it become perfectly smooth. This preparation affords a grateful and nutritive breakfast to persons liable to costiveness, in consequence of a sedentary life.

FLUOR SPAR, the native fluate of lime, from whence is obtained

FLUORIC ACID, the most remarkable property of this acid is the facility with which it corrodes glass and all siliceous bodies, especially when hot, and the ease with which it holds silica in solution, even when in a state of gas. Hence this acid has been applied to etching on glass vessels. [It is procured by decomposing Derbyshire spar. —T. C.]

FLUTE, an instrument of music, the simplest of all those of the wind kind. Its sound is exceedingly sweet and agreeable; and serves as a treble in a concert.

FLUTES or Flutings, in architecture, perpendicular channels, or cavities, cut along the shaft of a column, or pilaster. They are chiefly effected in the Ionic order, where they had their first rise: though, indeed, they are used all in the richer orders, as the Corinthian and Composite; but seldom in the Doric, and scarcely ever in the Tuscan. Each column has twenty-four flutes, and each flute is hollowed in exactly a quadrant of a circle: but the Doric has but twenty. Between the flutes are little spaces that separate them, which Vitruvius calls *stria*, and we *lists:* though, in the Doric, the flutes are frequently made to join to one another, without any intermediate space at all; the list being sharpened off to a thin edge, which forms a part of each flute.

FLUX, a disorder to which sheep are subject, when those useful animals, after having been kept on too short an allowance, suddenly come to their full feed. It is also sometimes occasioned by their eating the Fetid Chamomile, or May-weed, *Anthemis cotula*, L. This disease, however, is not attended with any dangerous consequences, and generally disappears in the course of a few days, especially in dry weather. But, if it continue longer than a week, some sweet and well dried hay should be given them.

Flux, or Sap-flow, *Fluxus umbilicalis*, a disease frequently occurring in plants and trees, when the alburnum, or sap-wood, is wounded during the spring; and which consists of a saccharine, mucilaginous fluid, resembling honey-dew. This affection occasions great trouble, especially when vines in hot houses are pruned too late in the season; for the whole branch is liable to bleed to death, in consequence of the loss of the sap, which ought to supply the young buds with nutriment, and expand their foliage.

There are some perennial plants, such as the cow-parsley, or *Heracleum spondylium*, L. the roots of which, if the stems be severely wounded, or entirely cut off, when they have attained a certain height, are liable to decay in consequence of this flux, or loss of the umbilical fluid. Hence Dr. Darwin observes, it has been recommended to mow down, early in the spring, thistles, and such other noxious weeds as are troublesome, on account of their rapid increase; because many of them will perish, and the rest will be considerably weakened by the great discharge of sap that flows from their wounds at that season.

With respect to *trees*, there is another period of sap-flow, that occurs when the new buds are forming, after Midsummer. It is therefore very injurious to wound trees at that period; and, as their vegetation is thus endangered, different applications have been recommended by gardeners. Dr. Darwin is of opinion, that a bit of sponge, if bound upon the end of the cut branch, or upon the wound, by means of some elastic bandage, will be the most certain remedy to save them; or, a wire may be substituted for the sponge, if twisted so tightly round the end of the maimed branch, as to check the circulation of the juices, and consequently to destroy the part above the ligature. [The place should be well smeared with flour.—T. C.]

Flux, a general term, in chemistry, to denote any substance or mixture added to assist in the fusion of minerals. The fluxes made use of in experiments consist usually of alkalies, which render earthy mixtures fusible, by converting them into glass; or by converting glass itself into powder. See Glass.

FLUXIONS, a method of calculation invented by Sir Isaac Newton. In this branch of mathematics, magnitudes of every kind are supposed to be generated by motion. This science is employed in the investigation of curves, in finding the contents of solids, and computing their surfaces; in finding the centres of gravities and oscillation of different bodies; the attractions of bodies under different forms; the direction of wind which has the greatest effect on an engine; and in the solution of many other interesting and important problems.

FLY, or *Musca*, L. an order of insects divided into several genera, of which we shall notice only those species that are more immediately connected with agriculture and domestic economy.

1. The *Dolphin*, or *Bean-fly*.

2. The *Corn*, or *Hessian-fly*, a native of the Landgravate of Hesse, whence it has received its name. This insect is particularly destructive to wheat-corn, in which it deposits its eggs close to the ground, while growing. When the young vermin are hatched, they continue for some time in a worm-state, feeding on the tender part of the stalk, the growth of which is thus effectually checked. The Hessian-fly committed great depredations in the Eastern counties of England, several years since, and, in the year 1787, did incalculable damage in the states of Pennsylvania and Maryland, in America. The only efficacious remedy hitherto discovered, consists in facilitating the vigorous growth of the plants, by properly manuring and cultivating the soil; which practice, as it will admit of late sowing, will greatly retard their progress.

Common opinion has ascribed the introduction of the Hessian-fly into America, to the troops from Hesse Cassel, which came over with the British troops, during the revolutionary war in the United States. But there is great reason to believe this opinion erroneous. Sir Joseph Banks informs Dr. Mitchill, that he has no reason to believe its existence in any part of Germany. Count Genanin of Ravenna has not mentioned the fly in his splendid work upon the diseases to which wheat is subject in its growing state, though fifty different insects are described.

Agreeably to the interesting observations of the late Hon. J. HAVENS of Long-Island, inserted in the 1st vol. of the *Transactions of the Agricultural Society of New York*, the maggot of the fly generally proves more destructive to wheat in the autumn of the year than in the spring; and before cold weather it is transformed into a chrysalis, in which state it is prepared to remain during the winter, and in the spring will again be transformed into a fly, which completes two generations of the insect in one year.

Mr. HAVENS says, the *bearded wheat* resists the fly most, though we know from the experience of Mr. COOPER, (below stated) and of others, that it is not always able to resist the sting of the fly.

As the fly is not to be found in any other state than that of chrysalis, in the time of harvest, and it remains in that state in the stubble for some time afterwards, Mr. H. recommends to burn the *stubble of grain after the harvest*, and to turn the ground over with the plough soon after, every year for several years, and has little doubt of its proving an effectual mean of destroying the whole species; for the insect would not long be continued on rye, which may be sown much later than wheat without injury from the winter.

The following directions to avoid the ravages of the fly are by JUDGE PETERS, of Philadelphia:

"After a crop of oats cut this season, (1802,) I ploughed in the stubble. The shed oats vegetated, and threw up plants generally through the field, which I am dressing with compost and stirring in, preparatory to a crop of wheat. The fly is now plentifully impregnating the oat plants.

"I am satisfied of the efficacy of the practice of lightly sowing fallows with oats, that the fly may deposit its brood in the oat plants, before the wheat is sown, or when it is young. The oat plants continuing to increase even with the young wheat, which it overgrows, afford a more inviting, because a more prominent object to this destructive but stupid insect, which does not discriminate between one plant and another. I mention *oats*, because it is a cheap and quick growing grain; and may (in this stage of its growth) occupy the fallows with the least injury. I know by repeated and careful observations, that the fly has no instinctive predilection for any particular plant. They light on all plants and shrubs indiscriminately. Some afford a better shelter, and protect their progeny, while on others they perish. Some plants are injured by them, and others are unhurt: in the wheat they do the most injury. It being our staple, and among the most valuable of our products, their progress in mischief is the most observed.

"I have had frequent opportunities of being convinced of the utility of the plan I now advise. I saw, among other instances, a remarkable clean and fair crop of wheat cut by one of my neighbours last year, saved by this method from the fly, which either injured or destroyed the crops of most others.

"*As my field will be in high order, and well manured, I intend to sow late.* I expect the oats will continue to produce plants, on which the successive flights of flies will exhaust themselves. The wheat plants may escape their ravages. I communicate this to invite other farmers to investigate the fact, and pursue a similar plan, by which many have informed me they have much benefited; some in a greater degree than others.

"I recommend sowing none but the fairest and best grains for seed. These produce vigorous plants, most capable of resisting the injuries from the fly. I do not believe in the magical power ascribed to *steeps*. I use steeps occasionally, that I may skim off the light, and cure the infected grain. They give an impetus and vigour to the first shoots of the plant, and so far are beneficial. But the crop requires other supplies in its progress. Steeps of various sorts have been recommended as *specifics* against the fly. But these are not exclusively to be depended on."

The following observations on this destructive insect, were communicated to Dr. MEASE by JOSEPH COOPER, Esq. of New-Jersey, to whom this work is indebted for several important articles:

"I first heard, a few years since, of the fly being in some wheat of a neighbour sown with turnips, which induced me to examine some wheat growing among buckwheat that had been sown in wheat stubble, and found the insect in great plenty. This caused me to suspend sowing wheat that year until the latter part of September: the wheat thus late sown appeared promising through the winter, but in the following month of April I discovered many plants of a darker green, the blades shorter, and more in clusters than the others, and the middle blades dead, or in a declining state; and, on examination, I found all having the above appearances, abounding with the insect. I pulled up many such plants, and putting them in glasses, covered them with perforated paper. In two or three weeks the fly came out: I then went into the field, where I discovered similar flies in great numbers, but the crop was still promising, although the plants which were much filled with the insect early in the spring had perished: the promising appearance continued until the grain was nearly filled, when a great part of it fell, and the crop was nearly half lost. I observed some late plants that were green at harvest almost as full of the insect as a piece of tainted meat with fly-blows. Seeing none after the beginning of September, and the weather having been very dry, and a rain coming on near the midle of that month, I was tempted to sow most of my wheat as soon as possible. The consequence was, although I sowed the *yellow bearded wheat*, that a lot of five acres which produced three hundred bushels of shelled Indian corn the year before, produced but six bushels of wheat. This deficiency I attributed solely to the ravages of the flies. The same year I sowed a piece of land of inferior quality, with the same kind of wheat, but two weeks later, and about two hundred yards from the other, which produced a good crop, and apparently not injured by the fly.

In the same or following year a friend who was attached to early sowing, had prepared a piece of excellent ground, manured it highly, and sowed it about the latter end of August, which, after making a promising appearance, was totally destroyed. In the beginning of October, he sowed an adjoining lot with wheat, in which he had raised pumpkins; the grain came up well, and made a fine appearance after the first snow that covered the ground, which fell the latter end of October, but was totally destroyed before winter. These experiments convinced me that sowing winter grain early is a mean of raising a brood of flies to deposit their eggs in, and thereby destroy the late sown grain in its vicinity. I had been informed of both wheat and rye sown in the spring, having been greatly damaged by the fly, but not sowing these grains, had not witnessed the fact until about three or four years ago, when I sowed some wheat and barley from La Plata, in April, in good land, well prepared: both made a promising appearance until the ears began to shoot, when the insects appeared on both, and were so numerous, that the barley was greatly injured, and the wheat nearly all destroyed. At the same time I had a lot less than 30 feet distant in wheat of the early Virginia kind, which had been sown the last week in October: it produced an excellent crop, and I did not perceive a single plant injured by the fly. The La Plata barley and wheat were sowed the next spring very early: the wheat being a later vegetable was destroyed by the fly, but the barley came forward so fast as to be proof against it, and has been sown every spring since, at the same early period, without receiving the smallest injury from the fly.

I am convinced from the above and other experiments, that if the farmers all through a neighbourhood would prevent as much as possible such grain as is nutritive to the Hessian fly from vegetating in the period between harvest and the latter end of September; have their land in a good state of cultivation, and sow about the beginning of October, or even later; and of the kind of grain which comes forward most rapidly in the spring, they would receive little injury from the wheat fly: and as the early Virginia wheat was produced from a plant selected by an observant farmer from his other wheat, there is no doubt that other sorts of grain might be improved by a selection of such particular plants as ripen earliest and are superior in other respects."

Mr. C. urges strongly the importance of sowing the early Virginia wheat as late in the autumn as can be done with safety: but at the same time observes, that no advantage would be derived from the practice, unless all the farmers in a neighbourhood agreed to pursue the same plan; for if an adjoining field be sown early, the flies which have been living on the grain of that field, will, after destroying it, deposit their eggs in the stalks of that which is late sown, and destroy it either in the autumn or succeeding spring.

The necessity of this general agreement among neighbours, upon a point equally interesting to all, being mentioned, affords an opportunity of enforcing the great advantages that would arise from a weekly or half monthly meeting of the farmers at a private house, or county town-house. At these meetings the general result of different modes of cultivating the same article, the success attending accidental or intended rotations of crops, and the means of guarding against destructive insects might be communicated; useful hints might be dropped in the course of conversation which others might improve, and *harmony greatly promoted*. A library might be kept at the place of meeting, and the township business also transacted.

3. The *Turnip fly*, which not only infests turnips, but also cabbages, flax, and other useful vegetables. In order to prevent the depredations of this insect, it has been recommended to mix three pounds of turnip-seed with one ounce of flour of sulphur in a glazed earthen pot, which should be closely covered; after standing twenty-four hours, another ounce of sulphur should be added, and the same quantity after forty-eight hours, so as to employ three ounces of this powder to three pounds of the seed, carefully stirring the whole every time the vessel is opened, with a smooth piece of wood or ladle, that the seed may be thoroughly impregnated with the sulphur. It is then to be sown on an acre of ground in the usual manner, where it will effectually keep off the insect till the third or fourth seeding-leaf is formed, which will acquire a bitterish taste, and thus be secured from the depredations of the fly. Another remedy is, to strew tobacco-dust over the land; and in some counties the seeds are steeped in soot and water for several hours previously to being sown, by which they acquire such a degree of bitterness, as to screen them completely against the ravages of this noxious insect.

There is a kind of fly which infests orchards, perforating the leaves of the trees, especially quinces; and which, though the foliage is afterwards renewed, occasions irreparable injury to the fruit. With a view to prevent these depredations, it has been recommended to mix a small quantity of diluted honey with some arsenic, which composition attracts the insects, and consequently destroys them. This remedy may, with due precaution, also be employed in houses where flies abound; and as flies are liable to great thirst, if a weak solution of arsenic with a little sugar be placed on a plate, in windows or on chimney-pieces, they will drink it eagerly, and thus meet with almost immediate destruction. [Or Fowler's ague drop sweetened.—T. C.]

Professor Tromsdorf has furnished us with an excellent remedy, that neither endangers the lives of children, nor is attended with much expense or trouble. Take two drachms of the extract of quassia, dissolve it in half a pint of boiling water, add a little syrup of sugar, and pour the mixture on plates: to this enticing food flies are extremely partial; and it is to them not less fatal than solutions of arsenic.

FLY, the Spanish, usually called by the plural name of *cantharides*, but properly speaking, is a chafer of a shining green colour, a blueish shade, and emitting an unpleasant narcotic odour. This insect is the *Meloe vesicatorius*, L. which preys on the leaves of the common lilac, *Syringa vulgaris*, L. privet, *Ligustrum vulgare*, L. common ash, *Fraxinus excelsior*, L. and other trees, though it seldom appears in our climate. Having already stated various substitutes for this foreign drug, under the head of Blister, and cautioned the reader against its indiscriminate application, we shall only add that the internal use of this medicine, even in very small doses, is extremely precarious, and ought, therefore, to be abandoned. Externally, the tincture of Spanish fly has often been employed with advantage as a *rubefacient*, by merely rubbing indolent swellings; or, the powder, as an ingredient in plasters, which ought, however, to contain but a very small portion of this powerful stimulant.

Four species of meloe that blister, are found in the United States. The first was brought into notice by Dr. Isaac Chapman, of Bucks county, Pennsylvania. The species described by Dr. Chapman feeds chiefly upon the potatoe; another upon the *Clematis Crispa*; a third (*Meloe* Penns. Lin.) upon *prunella vulgaris* or self heal, and *ambrosia trifida*, or stick weed. The *meloe majalis* has not yet been used to blister, though the attention of physicians was some years since directed to it by Dr. Shoepf.—From frequent trials the Editor is convinced that the powers of Dr. Chapman's blistering fly are equal to those of Europe.

FLY-BLOWN, a term expressive of that corruption of flesh-meat, or any animal food, which is occasioned by flies depositing their eggs on its surface, where they are subsequently bred into maggots. In the warm days of summer, meat is very liable to be thus tainted and rendered unfit for use, especially if it be kept in a close or damp place, which is not sufficiently ventilated. The easiest method of preventing such damage is that of suspending the joints in a *meat-safe*, or a wooden frame surrounded by close wires, so that the flies may be completely excluded, and the air still allowed to perflate the whole apparatus. An open and cool situation, however, ought to be chosen for this repository. Those families which are not provided with this useful domestic contrivance, may occasionally preserve joints of meat for several days, even in summer, by wrapping them in clean linen cloths, previously moistened with good vinegar, placing them in an earthen pan, and changing the cloth once or twice a day in warm weather.

[Meat is never fly-blown if it be hung up very high in the open air. The farmers of the back country, and the Indians well know this. See Flesh-meat. —T. C.]

FLYING, the progressive motion of a bird, or other winged animal, in the liquid air. The parts of birds chiefly concerned in flying are the wings, by which they are sustained or wafted along. The tail, Willoughby, Ray, and many others, imagine to be principally employed in steering and turning the body in the air, as a rudder: but Borelli has put it beyond all doubt, that this is its least use, and that it is to assist the bird in its ascent and descent in the air; and to obviate the vacillations of the body and wings: for the turning to this or that side is performed by the wings, and inclinations of the body, and but very little by the help of the tail. The flying of a bird, in effect, is quite a different thing from the rowing of a vessel. Birds do not vibrate their wings towards the tail, as oars are struck towards the stern, but waft them downwards: nor does the tail of the bird cut the air at right angles, as the rudder does the water; but is disposed horizontally, and preserves the same situation what way soever the bird turns.

In a word, as the vessel is turned about on its centre of gravity to the right, by a brisk application of the oars to the left, so a bird in beating the air with its right wing alone, towards the tail, will turn its fore part to the left. Thus pigeons, changing their course to the left, would labour with their right wing, keeping the other almost at rest. Birds of a long neck alter their course by the inclinations of their head and neck, which altering the course of gravity, the bird will proceed in a new direction.

"The manner of Flying" is this: the bird first bends his legs, and springs with a violent leap from the ground; then opens and expands the joints of his wings, so as to make a right line perpendicular to the sides of his body: thus the wings, with all the feathers therein, constitute one continued lamina. Being now raised a little above the horizon, and vibrating the wings with great force and velocity perpendicularly against the subject air, that fluid resists those successions, both from its natural inactivity and elasticity, by means of which the whole body of the bird is protruded. The resistance the air makes to the withdrawing of the wings, and consequently the progress of the bird, will be so much the greater, as the waft or stroke of the fan of the wing is longer: but as the force of the wing is continually diminished by this resistance, when the two forces come to be in equilibrio, the bird will remain suspended in the same place; for the bird only ascends so long as the arch of air the wing describes, makes a resistance equal to the excess of the specific gravity of the bird above the air. If the air, therefore, be so rare as to give way with the same velocity as it is struck withal, there will be no resistance, and consequently the bird can never mount. Birds never fly upwards in a perpendicular line, but always in a parabola. In a direct ascent, the natural and artificial tendency would oppose and destroy each other, so that the progress would be very slow. In a direct descent they would aid one another, so that the fall would be too precipitate.

FLYING, *Artificial*, that attempted by men, by the assistance of mechanics. The art of flying has been attempted by several persons in all ages. The Leucadians, out of superstition, are reported to have had a custom of precipitating a man from a high cliff into the sea, first fixing feathers, variously expanded, round his body, in order to break his fall. Friar Bacon, who lived nearly five hundred years ago, not only affirms the art of flying possible, but assures us, that he himself knew how to make an engine wherein a man sitting might be able to convey himself through the air, like a bird; and farther adds, that there was then one who had tried it with success: but this method, which consisted of a couple of large, thin, hollow copper globes, exhausted of the air, and sustaining a person who sat thereon, Dr. Hook shows to be impracticable. The philosophers of Charles the Second's reign, were much busied about this art. The famous bishop Wilkins was so confident of success in it, that he says, he does not question but, in future ages, it will be as usual to hear a man call for his wings, when he is going a journey, as it is now to call for his boots.

FLYING-FISH, a name given by English writers to several species of fish, which, by means of their long fins, have a method of keeping themselves out of the water a long time.

FLY-STRUCK, a disorder peculiar to sheep, which is occasioned by a fly that settles and deposits its eggs on them, and very materially injures the quality of the fleece.

In order to remove this malady, it has been recommended to cut off the wool, as far as it is infected, and to pour a few drops of the following mixture in a circle round the maggots, produced from the flies, to prevent their escape. Dissolve 20 grains of corrosive sublimate in a pint of whiskey.—Of this compound the shepherd ought to drop a little among the maggots, and rub them about with his finger: in consequence of which, they will be immediately destroyed. Another remedy, after clipping the wool, is, to rub the parts infected with finely powdered lime, or wood-ashes, and afterwards to anoint them with currier's oil, which will heal the wounds, and secure the animals from being stricken again.

FOAL, or Colt and Filly, the young of a horse.

FOCUS, in geometry and conic sections, a point where the rays reflected from all parts of a curve concur and meet.

FODDER, denotes any kind of dry food provided for horses, or other cattle: it is more particularly applied to hay and straw

Having already specified those vegetables which may be employed with the greatest advantage in the feeding of oxen, cows, bulls, &c. we shall here offer only a few observations supplementary to those stated under the article Cattle.

The saving of expense in obtaining manure, is an object of great importance to farmers; but there are few, comparatively speaking, who pay a due regard to this circumstance; and, by disposing [in England that is—T. C.] of their hard straw (such as that of barley, rye, &c.) for the purpose of thatching, they are under the necessity of purchasing dung, which expense might be completely obviated, by employing such straw in feeding their oxen and other *dry* cattle. See Straw-Cutter.

Considerable advantages might likewise be derived from the use of *compressed fodder*, invented by Mr. Lawson, of Rotherhithe-street, London. This consists of the haulms of field peas, beans, corn fodder, &c. which, after being cut off and dried, are mixed with certain portions of bruised corn, hay, bran, and broken oil-cake, and then formed into a stack, with clover, either in layers, or intermingled with that plant. To these articles, Mr. Lawson directs a quantity of straw to be added, in order to prevent the compressed food from becoming mouldy, together with a small portion of common salt, which will both preserve and improve the fodder. The saving that might arise from the use of such provender, Mr. Lawson estimates at not less than *one-eighth* part of the corn and herbage now consumed in racks, and given in an unbroken state, by which means the greater part of its most nutritious properties is, to many kinds of cattle, totally lost: whereas, by breaking the corn and other ingredients, no part can possibly remain in an undigested state, such as is frequently evident in horses fed with whole corn, which they void with their dung, being as perfect and entire as when it was first taken from the bin.

Alternate layers of second crop clover newly cut, and straw stacked, slightly salted, have been found an excellent food. The superabundant moisture of the clover is absorbed by the straw, which thus impregnated is eaten greedily by cattle and horses, and the clover being dried, is prevented from heating.

FOG, or Mist, a meteor consisting of gross vapours floating near the surface of the earth.

Fogs have a considerable influence on the winter. In the summer of 1783, an uncommon fog prevailed all over Europe, and great part of North America. It was dry, of a permanent nature, and the rays of the sun had but little effect in dissipating it, which they easily do in moist fogs arising from water. The effect of the rays in heating the earth was exceedingly diminished: hence its surface was frozen early, the first snows remained on it undissolved, and received continual additions; the air was more chilled, and intensely cold, and the winter of 1783 and 1784 was exceedingly severe.

The spring fogs are most detrimental to such young fruit, and other trees, as are planted in low situations; because they moisten the young shoots, and thus render them more liable to the injuries of the frosty nights succeeding them, but which they escape when placed in more elevated situations. —These fogs are converted into rime during the night, which thus falls on the trees, and is in some circumstances believed to shelter the vegetables by the heat it emits at the moment of its freezing: hence *black frosts*, which are not accompanied with rime, are said to be more prejudicial. But Dr. DARWIN remarks, that where dew or mist descends on vegetables, before the act of freezing commences, and is partly absorbed by them, they become more succulent, and are thus destroyed by their fluids being converted into ice.— To obviate this inconvenience, he proposes to make temporary sheds in the walls of gardens, projecting eight inches from the walls, and to be held by hooks that may be easily removed, when no more frosts are to be apprehended. Dr. DARWIN successfully tried this expedient with an apricot-tree, which was preserved uninjured, either by the fog, or the frosts that followed it, during the vernal nights.

FOIL, among jewellers, a thin leaf of metal placed under a precious stone, in order to make it look transparent, and give it an agreeable different colour, either deep or pale: thus, if you want a stone to be of a pale colour, put a foil of that colour under it; or if you would have it deep, lay a dark one under it.— These foils are made either of copper, gold, or gold and silver together: the copper foils are commonly known by the name of Nuremberg or German foils.

FOLIATING *of Looking-Glasses*, the spreading the plates over, after they are polished, with quicksilver, &c. in order to reflect the image. It is performed thus: a thin blotting paper is spread on the table, and sprinkled with fine chalk; and then a fine lamina or leaf of tin, called foil, is laid over the paper; upon this mercury is poured, which is to be distributed equally over the leaf with a hare's foot, or cotton: over this is laid a clean paper, and over that the glass-plate, which is pressed down with the right-hand, and the paper drawn gently out with the left: this being done, the plate is covered with a thicker paper, and laden with a greater weight, that the superfluous mercury may be driven out, and the tin adhere more closely to the glass.— When it is dried, the weight is removed, and the looking-glass is complete.

FOMENTATION, in the healing art, signifies the external application of a fluid in cases of swellings, &c. as warm as the patient can bear it, and in the following manner: Two pieces of flannel are dipt into the heated liquor, one of which is expeditiously wrung day, and thus immediately applied to the part affected. As soon as it begins to grow cool, the first is removed, and the other instantly substituted, in order to keep those parts constantly supplied with the warm flannels. This operation is continued for 15 or 20 minutes, and is repeated two or three times in the course of the day, as circumstances may require.

The design of fomentations may be fully answered, by the application of warm water alone, unless discutients or antiseptics are required; in which cases, such ingredients must be employed as are calculated to effect that purpose.

The degree of heat should on no account exceed that of producing an agreeable sensation; for too great heat is attended with effects, very different from those which are expected from the use of fomentations.

Fomentations are usually a decoction of herbs, water, wine, or milk; and the applying of bags stuffed with herbs and other ingredients, which is commonly called dry fomentation.

FOOD, generally speaking, denotes those alimentary substances which are taken into the stomach, whether fluid or solid; but it is usually confined to the latter kind.

In the early ages of the world, mankind were supported by acorns, berries, wild roots, and such other vegetables as the earth spontaneously produces. In succeeding centuries, as civilisation advanced, luxury also made rapid progress; men had recourse to animals, as well as to vegetables artificially raised for their sustenance; and, in still later ages, the art of preparing food has been improved, but is still far from perfection.

Though originally designed to be a blessing to mankind, as well as their support, food may, in many cases, be justly considered as a curse: for we do not hesitate to affirm, that the injudicious conduct of parents and nurses, during infancy, and the early years of childhood, lays the foundation of those numerous diseases, which, at a maturer age, arise from indigestion, and have, in many families, become hereditary.

The aliment of children ought to be adapted to their age, and the strength of their digestive powers. Hence they ought by no means to be fed immoderately, and promiscuously, with every kind of food: as, by this indulgence, the first passages are distended, and their stomachs gradually acquire an unnatural craving for victuals, before the preceding meal is properly assimilated. Such conduct is particularly injurious during the first year of their age: for, when their stomachs become more vigorous, they may be enabled, by slow degrees, to digest different kinds of victuals, the nature and properties of which are extremely opposite; though excess in quantity is always hurtful.—No food whatever, that has been prepared for many hours, should be given to children, especially after being *warmed up*, as it generates flatulence, heart-burn, costiveness, and a variety of disorders which are equally painful and difficult to remove. Sudden changes from liquid to solid food are equally dangerous: one kind of aliment only should be given at each meal, in moderate portions; and not a multiplicity of incongruous mixtures, in immediate succession, such as broth or soup, meat boiled or roasted, after taking milk, fruit, &c.

All stimulating dishes, prepared for adults, as well as beer, wine, spices, coffee, and other heating liquors, should be carefully withheld from children: as they often occasion eructions, vomiting, spasms, and convulsions, especially during dentition.

There is another abuse in the feeding of children, which cannot be too seriously reprehended, namely, to introduce chewed victuals into their mouth, a practice equally disgusting and unwholesome. Young and healthy mothers, it has been said, may safely perform this office for their children: but, in such case, it is requisite that the parent be in a complete state of health, that she be provided with sound teeth, and rinse her mouth previously with pure water. Under these circumstances, she may venture to perform mastication, though it would be more advisable to relinquish this filthy practice, and to give infants such food only as they are able to chew and digest.

Vegetables are, with a few exceptions, more difficult of digestion than *animal food;* but a due proportion of both, with the addition of acids, during the summer months, is alike grateful and conducive to health. The flesh of young quadrupeds is less nutritive than after they have attained a proper age; though it will, in general, be more easily converted into alimentary matter. In a *salted* state, meat loses a considerable part of its gelatinous particles, and becomes oppressive to the digestive organ, if made a principal article of food, and imparts a degree of acrimony to the human fluids, which has a tendency to generate putrid diseases, such as the scurvy of mariners. Hence it would be a desirable object to ascertain, by accurate experiments, whether beef, pork, &c. might not be kept fresh at sea for many months, merely by burying it in charcoal-powder, of which it could be easily divested by proper ablution.—[Meat preserved in a pickle of 50 oz. of salt and 3 oz. of saltpetre to a gallon of water and a pint of vinegar, would probably be more wholesome at sea than the pickled meat commonly used.—T. C.]

With respect to the quantity of food, there is one general rule, which ought never to be disregarded; namely, to cease eating, when the first cravings of appetite are satisfied, so as to renovate the waste which the body has apparently sustained. By a strict adherence to this principle, many of those distressing complaints arising from intemperance, might be effectually obviated; and our fashionable *watering-places* would not be so frequently crowded by the victims of luxury. [Not less than six hours should intervene between meals: seven hours interval is not too long, but this should not be exceeded.—T. C.]

FOOD OF PLANTS, an expression in agriculture and gardening, by which is understood whatever tends to increase the growth, by affording nourishment to vegetables when digested and assimilated.

FOOL'S-PARSLEY, or LESSER HEMLOCK, *Aethusa cynapium*, L. an indigenous plant, growing in corn-fields and kitchen-gardens, and flowering in the months of August and September.

This noxious weed resembles the common parsley, for which it is sometimes mistaken; but may be easily distinguished by its glossy surface, and total want of odour: when eaten among other plants, it occasions vomiting, violent cholic, and other painful symptoms. The fool's-parsley is eaten by horses, cows, sheep, and goats; but is pernicious to sheep.

FOOT, a part of the body of most animals whereon they stand. Animals are distinguished, with respect to the number of their feet, into *bipeds*, two-footed; such are men and birds; *quadrupeds*, four-footed, such are most land-animals: and *multipedes*, or many-footed, as insects. The reptile-kind, as serpents, have no feet; the crab kind of fish have ten feet; but most other fishes have no feet at all: the spider, mite, and polypus, have eight; flies, and grass-hoppers, have six feet. Animals destined to swim, and water-fowl, have their toes webbed together, as the goose and duck, &c. The fore-feet of the mole, rabbit, &c. are formed for digging and scratching up the earth, in order to make way for their head.

The principal cause of the lameness and distortion observable among many children, especially of the poorer class, is owing to an improper management of them, during their infancy. Instead of being carried on their nurses' arms, in a posture which contracts and palsies the lower extremities, they ought to be supported in such a direction that the legs and feet may be at liberty. Nor should they be confined too early in narrow shoes, with a view to render their feet small and *taper:* those necessary parts of our dress ought to be wide enough to allow sufficient room for motion, and might be fastened with strings, which are preferable to buckles.

[Bathing the feet in cold water daily and regularly, has a tendency to lessen the fits of gout.—T. C.]

Blistered feet, or vesicles containing water, may be prevented in the hot days of summer, by anointing the soles of the feet with mutton tallow, and wearing worsted socks.

The many melancholy instances of persons walking with inverted feet, which we daily see, cannot fail of causing regret among medical men in particular, from the circumstance of their knowing with what ease many of those cases might have been relieved by an early attention. In England great attention has been paid to cases of malconformation of the feet, and few cases are said to occur in which much of the deformity cannot be removed; but trials ought to be made before the age of two years. Mr. SHELDRAKE, of London, and Mr. WATT, of Paisley, in Scotland, have taken the lead in these complaints. A plate of Mr. WATT's machine may be seen in the *Medical and Physical Journal of London*, vol. 4.

FOOT is also a long measure, or measure of length, consisting of 12 inches.

Geometricians divide the foot into 10 digits, and the digit into 10 lines.

FOOT square, is the same measure, both in breadth and length, containing 144 square or superficial inches.

FOOT, cubic or solid, is the same measure in all the three dimensions, length, breadth, and depth or thickness, containing 1728 cubic inches.

FOOT-HALT, a disorder peculiar to sheep, and which is occasioned by an insect resembling a worm, two, three, and sometimes four inches in length. The first appearance of this malady is manifest by the lameness of the animal; a symptom which increases to so high a degree, as to prevent it from grazing. In consequence of pain, and want of food, the sheep lingers till at length it falls a victim to the disease, unless the worm be timely extracted; an operation that may be easily performed.

As soon as the animal begins to limp, the lame foot should be examined between the close of the claws, where the skin will be found perforated with a hole, through which the insect has worked itself a passage upwards, between the external membranes and the bone. In order to extract the worm, the claws should be moved in contrary directions, for a considerable time, till the insect gradually makes its way to the surface. This simple operation will be fully efficient, without any other application; and it is certainly preferable to drawing the worm out; as in the latter case there is always danger of its breaking off, and rotting in the sheep's leg, which would materially injure the animal.

The *foot-halt* occurs more frequently in wet than in dry seasons; generally in the spring and autumn, but seldom in the summer and winter. Sheep that are pastured in high, healthy grounds, are less liable to be attacked by this insect, than those which graze in low meadows, or marshy soils.

FOOT-ROT, a disease to which sheep are subject, and which is said to be contagious.

The first symptom of the disorder is manifest, when the animal affected begins to limp; though no injury will be perceptible on examining the foot, which is extremely hot.

The second stage of the distemper is a yellowish-white spot, that appears in the cleft of the hoof, spreads gradually, and becomes livid; destroying the hair, which in sound animals covers the foot. At this period, the diseased part acquires a disagreeable smell, and the lameness increases.

In the third stage, the malady sinks into the frog of the foot; the shell of the hoof loosens, and the frog is filled with fetid matter, that oozes out when pressed by the hand: a small tumour sometimes breaks out in the front of the leg, about one inch above the hoof, which, however, is easily dispersed.

In the last stage, the foot is so completely mortified by the cancerous humour corroding every part of it, as to become incurable; in which case, the skin is the only valuable part of the animal.

Through these different periods, the sheep affected retain their appetite, and feed apparently as well as when in health; but they very soon fall away, and continue to decline, till they have lost all their fat. Notwithstanding their rapid decay, at the end of the second and the commencement of the third stage, they are so eager for food, that they even crawl on their knees for sustenance.

For the cure of this infectious disorder, different remedies have been prescribed; from which we select the following:

1. Take 3 oz. of verdigris; and 1 oz. white copperas, finely pulverised, and dissolved in a quart of white-wine vinegar.

2. Let 4 oz. of the best honey; 2 oz. of burnt alum reduced to powder, and ½ lb. of pulverised Armenac bole, be mixed in as much train or fish oil as will convert these ingredients into the consistence of salve: the honey ought first to be gradually dissolved, when the bole should be properly stirred in, after which the alum and train oil are to be added.

The parts affected may be rubbed with either of these compositions; unless the distemper has become incurable; but in the opinion of Mr. ARTHUR YOUNG, in the 21st vol. of *Annals of Agriculture*, the 2d recipe is most efficacious.

This malady, in general, arises from long grass in wet seasons; but, if sheep be suffered to lie upon their own dung, a fermentation will take place, and occasion either the *foot-rot*, or the *foot-halt*: to prevent which fatal disorders, those animals should be well littered, and kept with a strict attention to cleanliness.

FORAGE, in the military art, denotes hay, oats, barley, wheat, grass, clover, &c. brought into the camp by the troopers, for the sustenance of their horses. Dry forage is the hay, oats, &c. delivered out of the magazines, to an army in garrison, or when they take the field, before the green forage is sufficiently grown up to supply the troops. It is the business of the quarter-master-general to appoint the method of forage, and post proper guards for the security of the foragers.

FORCE, in mechanics, denotes the cause of the change in the state of a body, when being at rest it begins to move.

FORCING, in horticulture, is the art of producing ripe fruits from tress, before their natural season, or in less temperate climates.

A wall should be erected ten feet in height; a border marked out on its south-side, about four feet wide; and stakes fastened into the ground along the edge of the border, at the distance of four inches. These are intended for the support of the glass lights (or, with less expense, frames covered with oiled paper), which are to be placed in a sloping direction towards the wall, to shelter the fruit, as occasion may require: at each end, a door is to be so constructed that it may be opened either way, according to the course of the wind. The frame ought to be moveable; because after a tree has been covered one year, the former should be removed to another; observing that each fruit-tree be forced only once in three years: by this arrangement, they will be more durable and productive.

Previously to applying the dung to the wall, it should be thrown together in a heap, for five or six days, that it may thoroughly ferment; thus prepared, it ought to be laid four feet thick at the base of the wall; and continued upwards in a sloping direction, till it is about two feet in thickness, within a few inches from the top of the wall; but, as it sinks, more dung should be added, for the first heat will only swell the blossom-buds. The proper season for laying it, is about the latter end of November; and, for ripening cherries, three changes of dung will be sufficient to produce very fine fruit in the month of February. This method of forcing, however, being often very expensive and troublesome, *tanner's waste* is now almost universally employed for producing artificial heat, by enclosing it to the depth of three or four feet, within the walls of a hot-house.

Early and late ripening fruits should never be placed together; because the requisite degree of heat for forcing the latter, would be very prejudicial to the former, after they have produced fruit. Glass, or oiled paper frames, are of considerable service for covering trees; but they should occasionally be removed, to admit the benefit of gentle showers; and the doors at the ends may, in warm weather, either be left entirely open, or one of them only closed. A mat should be suspended before the doors, to protect the trees from night frosts.

FORECASTLE of a ship, that part where the foremast stands. It is divided from the rest by a bulk-head.

FOREMAST of a ship, a large round piece of timber, placed in her fore-part, or fore-castle, and carrying the foresail and fore top-sail yards. Its length is usually 8-9ths of the main-mast; and the fore-top gallant-mast is half the length of the fore-top-mast. See MAST.

Foremast-men are those on board a ship that take in the top-sails, sling the yards, furl the sails, bowse, trice, and take their turn at the helm.

FORE-STALLING is the buying of, or bargaining for, corn, cattle, or other merchandise, in its passage to fairs, or markets, for sale, with an intent to dispose of them again at an advanced price.

In England the punishment for this offence, on conviction by two or more witnesses, is, for the *first* time, two months imprisonment, and forfeiture of the goods, or their value; for the *second*, the offender incurs an imprisonment of six months, and loses double the value of the articles; and, for the third offence, he is liable to imprisonment during the King's pleasure; to a forfeiture of all his property; and is to be sentenced to stand in the pillory. [The justice or the prudence of making this a criminal offence may well be doubted. These persons are no more *guilty* than any other class of merchants, factors, or middle men.—T. C.]

FORFICULA, the earwig, a genus of insects of the order coleoptera, containing eighteen species, of which the forficula auricularia is very common in wet ground, ripe fruit, and old wood; and has been occasionally found to creep into the ears of such as sleep in the open air; when it is easily destroyed by dropping into the ear either a little oil or spirits, or both. The eggs are white and oval, and large for the size of the insect; they are found deposited in damp situations, and generally under stones. The parent is more provident of the young larvæ, than insects generally are, brooding over them for several hours in the day, after the manner of birds.

FORGE, properly signifies a little furnace, wherein smiths and other artificers of iron or steel, &c. heat their metals red-hot, in order to soften and render them more malleable and manageable on the anvil.

FORGE is also used for a large furnace, wherein iron-ore, taken out of the mine, is melted down; or it is more properly applied to another kind of furnace, wherein the iron-ore, melted down and separated in a former furnace, and then cast into sows and pigs, is heated and fused over again, and beaten, afterwards with large hammers, and thus rendered more soft, pure, ductile, and fit for use. Of these there are two kinds: the first is called the finery, where the pigs are worked into gross iron, and prepared for the second, which is called the chafery, where it is farther wrought into bars fit for use.

FORGERY, an offence which, at common law, is punishable with fine, and imprisonment. A forgery in England consists in affixing the name of an individual, in a manner purporting to be his hand-writing, to a paper, the contents of which tend to the injury of his estate.

FORGING, in smithery, the beating or hammering iron on the anvil, after having first made it red-hot in the forge, in order to extend it into various forms, and fashion it into works. There are two ways of forging and hammering iron; one is by the force of the hand, in which there are usually several persons employed, one of them turning the iron and hammering likewise, and the rest only hammering. The other way is by force of a water mill, which raises and works several huge hammers beyond the force of man: under the strokes whereof the workmen present large lumps or pieces of iron, which are sustained at one end by the anvils, and at the other by iron chains fastened to the ceiling of the forge.

This last way of forging is only used in the largest works, as anchors for ships, which usually weigh several thousand pounds. For the lighter works, a single man serves to hold, heat, and turn with one hand, while he hammers with the other.

Every purpose the work is designed

for, requires its proper heat; for if it be too cold, it will not feel the weight of the hammer, as the smiths call it, when it will not batter under the hammer; and if it be too hot, it will redsear, that is, break, or crack, under the hammer.

The several degrees of heats the smiths give their irons are, first, a blood-red heat; secondly, a white flame heat: and, thirdly, a sparkling or welding heat.

FORMIC ACID, in chemistry, the acid of ants, which is extracted from them either by distillation or expression with water; in the living insect it reddens blue flowers, goes off in the form of a vapour, smelling like musk, and destroys animals. Under this gaseous form it is capable of serving economical purposes like vinegar; is decomposed by a great heat, takes oxygen from oxygenated muriatic acid; and forms salts with alkalies and earths, which are chrystallisable and not deliquescent.

FORT, in the military art, a small fortified place, environed on all sides with a moat, rampart, and parapet. Its use is to secure some high ground, or the passage of a river, to make good an advantageous post, to defend the lines and quarters of a siege, &c. Forts are made of different figures and extents, according as the ground requires. Some are fortified with bastions, others with demi-bastions. Some again are in form of a square, others of a pentagon. A fort differs from a citadel, as this last is built to command some town.

FORTIFICATION, the art of fortifying a town, or other place; or of putting it in such a posture of defence, that every one of its parts defends, and is defended, by some other parts, by means of ramparts, parapets, moats, and other bulwarks; to the end, that a small number of men within may be able to defend themselves for a considerable time against the assaults of a numerous army without; so that the enemy, in attacking them, must of necessity suffer great loss.

Fortification is either ancient or modern, regular or irregular. Ancient fortification, at first, consisted of walls or defences made of trunks, and other branches of trees, mixed with earth, to secure them against the attacks of the enemy. This was afterwards altered to stone-walls, on which were raised breast works, behind which they made use of their darts and arrows in security. Modern fortification, is that which is flanked and defended by bastions and out-works, the ramparts of which are so solid, that they cannot be beat down but by the continual fire of several batteries of cannon. Regular fortification is that built in a regular polygon, the sides and angles of which are all equal, being commonly about a musket shot from each other. Irregular fortification, on the contrary, is that where the sides and angles are not uniform, equidistant, or equal; which is owing to the irregularity of the ground, valleys, rivers, hills, and the like.

The principal maxims of fortification are these: 1. That every part of the works be seen and defended by other parts, so that the enemy can lodge no where without being exposed to the fire of the place. 2. A fortress should command all places round it; and therefore all the out-works ought to be lower than the body of the place. 3. The works farthest from the centre, ought always to be open to those more near. 4. No line of defence should exceed a point blank musket-shot, which is about an hundred and twenty or an hundred and twenty-five fathoms. 5. The more acute the angle at the centre is, the stronger will be the place. 6. In great places, dry trenches are preferable to those filled with water, because sallies, retreats, and succours are frequently necessary; but, in small fortresses, water-trenches, that cannot be drained, are best, as standing in need of no sallies. Different authors recommend different methods of fortification; but the principal are those of PAGAN, BLONDEL, VAUBAN, and SCHEITER.

FOSSIL, in natural history, any thing dug out of the earth, whether that be its natural or its accidental situation; a body of the first kind being called native, and one of the second extraneous.

I. *Native fossils* are substances found either buried in the earth, or lying on its surface, of a plain simple structure, and showing no signs of containing vessels, or circulating juices.

II. *Extraneous fossils* are bodies of the vegetable or animal kingdoms, accidentally buried in the earth.

1. Of the vegetable, the principal kinds are trees and herbaceous plants, or the parts of these.

2. Of the animal there are four kinds: 1. sea-shells; 2. the teeth, or bony palates and bones of fishes; 3. complete fishes; 4. the bones of land animals.

FOSSIL ALKALI, a name given to

soda, because this alkali is the basis of sea salt which is a fossil, dug out of the earth. It is also the basis of Glauber's salts. It is procured 1 by the incineration of maritime plants. 2. By decomposing common salt by means of litharge. 3. By decomposing Glauber's salt in a reverberatory furnace, by means of charcoal dust and chalk: or by means of charcoal dust and old iron. 4 It is imported from the East Indies. It is used to make hard soap, and also to make glass.—T. C.]

FOUNDERED, a disease in the feet, to which horses are subject. It is occasioned by hard riding, severe labour, great heats, sudden colds, &c. that inflame the blood, and, as the farriers express it, *melt the grease*, which descends into the feet; where it settles and causes such a numbness and pricking in the hoof, as in some instances to render the animal affected unable to stand.

The general methods of removing this disorder are, first, bleeding, which operation, if opportunely performed, is calculated to afford immediate relief. The rapid and irregular circulation of the blood is then to be diminished, by giving the horse cooling salts internally, clysters, an opening diet, and plenty of diluting liquor four or five times every day, together with emollient poultices; which ought to be applied warm round the hoofs, in order to soften them, and to promote a free and equal perspiration.

But the sole or frog of the foot affected, should on no pretence be pared to that excess, which is too frequently done by ignorant farriers. It will be sufficient to clear away the hardened surface of the sole, that the poultice may properly open the pores. All greasy and oily applications should likewise be avoided, being ill calculated to accelerate the cure.

[This disease is a kind of gout, produced by permitting the animal to eat or drink heartily while hot; or by violent exercise on a full stomach. The cure is bleeding, purging and rest. Take off the shoes.—T. C.]

FOUNDRY, the art of casting all sorts of metals into different forms. It likewise signifies the work-house, or smelting hut, wherein these operations are performed.

Foundry, *Letter, or casting of printing letters.* The first thing requisite is to prepare good steel punches, on the face of which is drawn the exact shape of the letter with pen and ink, if the letter be large; or with a smooth blunted point of a needle, if small; and then, with proper gravers, the cutter digs deep between the strokes, letting the marks stand on the punch; then files the outside, till it is fit for the matrice. They have a mould by which to justify or regulate the matrices, and which consists of an upper and under part, both which are alike, except the stool and spring behind, and a small roundish wire in the upper part for making the nick in the shank of the letter. These two parts are exactly fitted into each other to slide backward and forward. Then they justify the mould by casting about twenty samples of letters, which are set in a composing-stick, with the nicks towards the right hand; and comparing these every way with the pattern letters, set up in the same manner, they find the exact measure of the body to be cast. Next they prepare the matrice, which is of brass or copper, an inch and a half long, and of a proportionable thickness to the size of the letter it is to contain. In this metal is sunk the face of the letter by striking the letter punch the depth of an *n*. After this the size and face of the matrice are justified, and cleared, with files, of all bunchings that have been made by sinking the punch. Then it is brought to the furnace, which is built upright of brick with square sides, and a stone at top, in which is a hole for the pan to stand in. They have several of these furnaces. The metal of which types are formed is lead, with a mixture of the regulus of antimony, or such other substance as the letter founder approves. These being duly mixed, and melted in a large cauldron of cast-iron, by continued stirring with an iron ladle, the workmen proceed to draw the metal off into small troughs of cast-iron, which are ranged to the number of fourscore on a level platform faced with stone. In the course of a day, fifteen hundred weight of metal can be prepared in this manner.

The founder must now be provided with a ladle differing from other iron ladles only in its size, which is adapted to that of the letter he is to cast. Before he begins this operation, he must kindle the fire in his furnace to melt the metal in the pan. If it be a small bodied letter, or a thin letter with great bodies, that he intends to cast, his metal must be very hot, and sometimes red hot to make the letter come. Then taking the ladle that will hold as much as will make the letter and break, he lays it at the hole, where the flame bursts out, to heat; then he ties a thin leather cut with its narrow end against the face, to the leather groove of the matrice, by whipping a brown thread twice about the leather groove, and fastening the thread with a knot. Then he puts both pieces of the mould together, and the matrice into the matrice-cheek; and places the foot of the matrice on the stool of the mould, and the broad end of the leather on the wood of the upper haft of the mould, but not tight up, lest it hinder the foot of the matrice from sinking close down upon the stool, in a train of work. Afterward, laying a little rosin on the upper part of the mould, and having his casting ladle hot, he, with the bolling side, melts the rosin and presses the broad end of the leather hard down on the wood, and so fastens it thereto. In the act of casting, placing the under half of the mould in his left hand with the hook or jag forward, he holds the ends of its wood between the lower part of the ball of his thumb and his three hinder fingers; then he lays the upper half of the mould upon the under half; and, at the same time, the foot of the matrice places itself upon the stool, and clasping his left hand thumb strongly over the upper half, he nimbly catches hold of the bow, or spring, with his right hand fingers at the top of it, and his thumb under it, and places the point of it against the middle of the notch in the reverse side of the matrice, pressing it forward as well toward the mould as downward, by the shoulder of the notch, close upon the stool, while at the same time with his hinder fingers, he draws the under half of the mould toward the ball of his thumb, and thrusts with the ball of his thumb, the upper part towards his fingers, that both the registers of the mould may press against both sides of the matrice, and his thumb and fingers press both sides of the mould close together. Then he takes the handle of his ladle in his right hand, and with the ball of it gives two or three strokes outwards upon the surface of the melted metal, to clear it of the scum; then he takes up the ladle full, and having the mould in the left hand, turns his left side a little from the furnace, and brings the jet of his ladle to the mouth of the mould; and turns the upper part of his right hand towards him, to pour the metal into it, while at the same instant, he puts the mould in his left hand forwards, to receive the metal with a strong shake, not only into the bodies of the mould, but, while the metal is yet hot, into the very face of the matrice, to receive its perfect form there as well as in the shank. Then he takes the upper half of the mould off, by placing his right thumb on the end of the wood next his left thumb and his two middle fingers at the other end of the wood: he tosses the letter, break and all, upon a sheet of waste paper, laid on a bench, a little beyond his left hand; and then is ready to cast another letter, as before, and likewise the whole number in that matrice.

Then boys, commonly employed for this purpose, separate the breaks from the shanks, and rub them on a stone, and afterwards a man cuts them all of an even height, which finishes the fount for the use of the printer. A workman will ordinarily cast 3000 of these letters in a day. The perfection of letters thus cast consists in their being severally square and straight on every side; all of the same height and evenly lined, without stooping one way or other; neither too big in the foot, nor the head; well grooved, so as the two extremes of the foot contain half the body of the letter; and well ground, barbed, and scraped, with a sensible notch.

FOUNT, among printers, a set or quantity of letters, and all the appendages belonging thereto, as numeral characters, quadrates, points, &c. cast by a letter founder, and sorted.

Founts are large or small, according to the demand of the printer, who orders them by the hundred weight or by sheets. When a printer orders *a fount of five hundred*, he means that the fount should weigh 500 pound. When he demands a fount of ten sheets, it is understood that with that fount he shall be able to compose ten sheets, or twenty forms, without being obliged to distribute. The founder takes his measures accordingly; he reckons 120 lb. for a sheet, including the quadrates, &c. or 60 lb. for a form; which is only half a sheet: not that the sheet always weighs 120 lb. or the form 60 lb.; on the contrary, it varies according to the size of the form; besides, it is always supposed that there are letters left in the cases. As therefore every sheet does not comprehend the same number of letters, nor the same sort of letters, we must observe, that, as in every language some sounds recur more frequently than others, some letters will be in much more use, and oftener repeated than others; and consequently their cells or cases should be better stored than those of the letters which do not recur so frequently: thus, a fount does not contain an equal number of *a* and *b*, or of *b* and *c*, &c. the letter-founders have therefore a list or tariff, or, as the French call it a *police*, by which they regulate the proportions between the different sorts of characters that compose a fount; and it is evident that this tariff will vary in different languages, but will remain the same for all sorts of characters employed in the same language.

FOUNTAIN, or *artificial fountain*, in hydraulics, called also a *jet d'eau*, is a contrivance by which water is violently thrown upwards. See HYDRAULICS.

FOX, or *Canis vulpis*, L. an animal of the canine race, well known for his cunning, and the depredations he commits in farm-yards among poultry, and in warrens among rabbits.

Foxes produce but once a year, and the litter generally consists of four or five, but seldom six or eight, and never less than three. The time of gestation is in the winter, and young cubs are found in the month of April. These, like dogs, are brought forth blind; they continue to grow fifteen months or longer, and live to the age of fourteen years.

It is remarkable, that on its long hairy tail the fox has a small bunch of hair which emits an agreeable odour, not unlike that of violets: this proceeds from a gland secreting a viscous humour. His woolly tail is dexterously employed for catching lobsters from the hollows of brooks and rivulets, as well as for blinding his persecutors, the dogs, &c. when it is moistened with urine. He is said to rid himself in summer of fleas, by first seizing with his mouth a parcel of moss, then gradually, but with retrograde steps, immerses himself in water to the point of his mouth; and, when these vermin have retreated to the moss, he suddenly drops his cargo.

The fox is not easily, and never completely tamed: when deprived of liberty he languishes; and if kept too long in a domestic state, he dies of chagrin. His skin is furnished either with a white, grey, blueish, or black fur, which, on account of its softness and warmth, is in many parts of Europe employed for making muffs, and lining clothes. The fur of the black fox caught in the north, is sometimes sold at the excessive price of 200 guineas.

Various methods are practised for exterminating these predatory animals: they are hunted with dogs; iron traps are frequently set at their holes, which are also occasionally smoaked to expel them, so that they may the more readily fall into the snares laid for their destruction. The most common mode of taking foxes, is by means of gins: these being baited, and a train made by drawing raw flesh across his usual paths, or haunts, to the trap, he is frequently decoyed. We conceive, however, that the most easy method of reducing him to captivity, would be in imitation of that practised in the immense woods of Poland, for catching wolves alive. It simply consists in digging *circular* holes of sufficient depth, depositing fœtid carcasses in them as an allurement, and covering them with boards and moss provided with a trap-door level with the ground. In this manner, great numbers of foxes might be destroyed, and much injury prevented.

FOX-GLOVE, the COMMON, or PURPLE, *Digitalis Purpurea*, L. an indigenous biennial plant, growing in England, in meadows, on hedge-banks, and the sides of hills; in dry, gravelly, or sandy soils, but seldom on flat grounds, unless in very dry situations: for, though the seeds vegetate, the roots decay in the winter, and the plant consequently perishes. It produces purple flowers, which blow in the months of June and July.

The leaves of the fox-glove have a bitter nauseous taste, but do not possess any peculiar smell; they have long been used with considerable advantage, [but requires to be prescribed by a physician, as it is a very dangerous remedy in many cases.—T. C.]

[The *digitalis*, as was stated under the head consumption, has unquestionably done good, in that and other diseases. But it cannot be concealed, that it has frequently failed, and that much mischief also has been occasioned by its exhibition. The causes of the failure of this medicine have been detailed by Dr. MEASE in a paper inserted in the *New York Medical Repository*, vol. 1. p. 153. To this paper the reader must be referred for a particular notice on each head, all of which it may be well here to state generally.

1. The season of collecting the plant.
2. The part of the plant used.
3. The mode of curing it.
4. The adulteration of the plant.
5. The manner of exhibiting it.

6. The condition of the system at the time of use.

The most common effects observed from full doses, are vertigo, pain or throbbing of the forehead, or eyes, imperfect vision, nausea, vomiting, *reduction in the force and frequency of the pulse*, or extreme irregularity in it. Whether the medicine be given therefore in dropsy or consumption, the greatest certainty ought to exist, that inflammatory action is prevalent in the system: otherwise much harm may be expected from the medicine. As a general rule, it may be observed that great caution is requisite in its use, though perfectly safe, when judiciously administered. Dr. M'Clean in the *Medical and Physical Journal of London*, vol. ii. p. 113, has published an admirable paper on the medical use of this plant, and advises the following form of its exhibition.

Leaves of the fresh plant 4 oz.
Spirit of wine - 5 oz.

Digest during seven days with a gentle heat, and strain. Of this medicine thirty drops or less may be given to an adult thrice a day. Physicians should cultivate this plant for their own use, as it never can be depended upon when bought at the shops.—Dr Mease.]

FOX-TAIL-GRASS, or *Alopecurus*, L. a genus of plants consisting of 18 species, of which Dr. Smith enumerates four, and Dr. Withering six, to be natives of England: the principal of these are the following:

1. The *pratensis*, or Meadow Fox-tail-grass, which is perennial, grows in meadows and pastures, and flowers in the month of May or June. This plant thrives naturally in moist soils only; it affords the best grass that can be sown on low meadows, or in boggy places which have been newly drained. Its seeds ripen early, and are easily collected. Although sheep pasturing on it, are said to acquire a coarser fleece, yet it furnishes a most grateful food to cattle; but as the larvæ of a species of flies devour the seeds to so great an extent, that in many spikes scarcely one will be found perfect, its cultivation is rather precarious. These insects are very minute, of an orange colour, and are the prey of the *Cimex campestris*, or Field-bug, whose mouth is peculiarly formed for searching the husks of grasses.

2. The *bulbosus*, or Bulbous Fox-tail-grass, which is perennial, grows in moist marshy situations, and flowers in the months of June and July. This species is particularly adapted for consolidating the surface of fenny situations. Hence it deserves to be more generally cultivated in such soils, in order to prevent them from being poached by the feet of cattle.

3. The *agrestis*, or Slender Fox-tail-grass, which is likewise perennial, grows in corn-fields or on road sides, and flowers in the month of July. This plant is provincially called *black-bent*; and, though a very troublesome weed, when growing among wheat, it might be sown with advantage as a meadow-grass; for, in its green state, it is much relished by cattle; and Bechstein asserts, that cows fed with it, give an unusual quantity of milk. See Grasses.

FRACTURES of *Bones*, are accidents which generally arise from external injury. They are either *simple*, when the skin and other integuments remain sound; or *double*, when splinters are projecting, and the fracture communicates with a wound.

If, after a severe fall, or blow, the patient feels pain, accompanied with swelling, and tension of the contiguous muscles; when a grating noise, distortion, and a loss of muscular power are perceived on handling the injured part, there is every reason to apprehend that the bones are broken. No time should then be lost in applying to a skilful surgeon; as fractures and contusions, especially those of the ribs, are generally attended with febrile symptoms, which require the immediate use of the lancet. Meanwhile, the limb should be placed in the easiest posture, and the body kept quiet, cool, and open, by emollient clysters.

FRAXINUS, the *ash*, in botany, a genus of trees, belonging to the polygamia diœcia class: the fruit is single, of a compressed lanceolate figure, and is what we commonly call the ash-key, several clusters of which are affixed to the same common pedicle. The wood of this tree is in great use among several artificers, as wheel-wrights, cartwrights, carpenters, and turners, for making ploughs, harrows, axle-trees, oars, and various other articles. It is said to be as lasting for building as oak, and often preferred before it; though the timber of the trunk greatly excels that of a bough. Some ash is also so curiously veined, that the cabinet-makers equal it to ebony, and call it green-ebony; so that the woodmen, who light upon such trees, may have for it what they will.

FRECKLES, are spots of a yellowish

colour, about the size of a lentile-seed, frequently appearing on the face, neck, and hands. These discolourations are either constitutional in the individual, or arise in consequence of the jaundice, or the action of the sun upon the part. Heat, or a sudden change of the weather, often causes the skin to assume a darker colour than natural, and thus produces what is called, *tan, sun-burn,* and *morphew*, which differ only in degree, and usually disappear in winter.

Persons of a delicate complexion, and particularly such as have naturally red hair, are most subject to freckles in the face, and other parts exposed to the air.

As, however, freckles generally vanish during the winter, and have been observed to re-appear in early spring, the sharp *morning-air* of which, though salubrious, is said to be uncommonly favourable to their reproduction, perhaps the most easy method of preventing them, would be a careful attention to this circumstance.

FREEHOLD, signifies lands or tenements which a person holds in fee-simple, fee-tail, or for term of life. Freehold is distinguished into freehold in deed, and freehold in law; the first of which signifies the real possession of lands, &c. in fee, or for life; the other is the right that a person has to such lands or tenements before his entry. Freehold is also extended to such offices as a man holds in fee, or during life.

FREE-STONE, a whitish stone dug up in many parts of England, that works like alabaster, but is more hard and durable. It is a kind of the grit-stone, but finer sanded, and a smoother stone, and is called free, from its being of such a constitution as to cut freely in any direction: such as the Portland-stone, and the free-stone of Kent.

FREEZING, in physics, the same with congelation. When a body passes from a solid to a fluid state, the absorption of heat by that body (the which, as has been said, causes its fluidity), produces a degree of sensible surrounding cold. A very cheap and easy experiment will manifest this fact: take equal parts of salt-petre and sal-ammoniac, finely powdered, and upon three ounces of this mixture pour four ounces of spring water, and it will be found that the sudden dissolution of these salts will render the water so cold as to sink a thermometer plunged in it, thirty-six degrees. As therefore, even in summer, it is easy to procure spring or pump water at the temperature of fifty degrees, the addition of the salts will reduce that temperature to fourteen degrees; which is sufficient to freeze the water of a phial plunged into it, into one complete mass of ice. Another freezing mixture, which is still more powerful, may be made by adding to pounded ice, or to snow, a quantity of common salt. The salt is of a temperature above freezing; but the ice or snow, having a stronger attraction than the salt for the caloric it contains, will absorb the latter: the ice or snow being thus rendered fluid, will dissolve the salt. From both these effects a great quantity of heat will be absorbed; and consequently the mixture will be much colder than either snow or the salt separately, and will freeze very powerfully any fluid with which it is brought in contact. See Cold.

FREIGHT, in navigation and commerce, the hire of a ship, or a part thereof, for the conveyance and carriage of goods from one port or place to another; or the sum agreed on between the owner and the merchant, for the hire and use of a vessel.

FRESCO. See Painting.

FRET, or Frette, in architecture, a kind of knot or ornament, consisting of two lists or small fillets variously interlaced or interwoven, and running at parallel distances equal to their breadth. Every return and intersection of these frets must be at right angles, otherwise they lose all their beauty, and become perfectly gothic. Sometimes the fret consists but of a single fillet, which, if well disposed, may be made to fill its space exceedingly well.

FRICTION, in mechanics, the rubbing of the parts of engines and machines against each other, by which means a great part of the effect is destroyed. The causes of friction are (1) The roughness of the contiguous surfaces: (2) The irregularity of the figure, which arises either from imperfect workmanship, or from the pressure of one body on another: (3) An adhesion, or attraction which is more or less powerful according to the nature of the bodies in question: and (4) The interposition of extraneous bodies, such as moisture, dust, &c. In all machines one fourth or even one third of the power must be considered as lost by friction, that is, if it gain by calculation 450 lbs. more than about 300 lbs. gain, in practice, must not be depended on.

FRICTION, in medicine, is the act

of rubbing a diseased part with oils, unguents, and other matters, in order to ease, relieve, and cure it.

Friction is also performed with a flesh-brush, a linen-cloth, or with flannel; which last is the most eligible. It is a kind of exercise that remarkably contributes to the health of sedentary persons; for it excites and kindles the natural warmth; diverts defluxions; promotes perspiration; opens the pores; and tends to dissipate stagnant humours.

This operation is particularly beneficial to the nervous, debilitated, and studious: being an useful substitute for other exercises. Hence we recommend to such individuals to spend half an hour every morning and evening in rubbing their whole body, especially their limbs, with a clean piece of flannel. It ought, however, to be observed, that this practice will be of the greatest service when the stomach and bowels are empty.

Lastly, we venture to affirm, that the most important purposes to which *friction* may be rendered subservient in the animal economy, have hitherto been almost entirely neglected: we are, however, convinced from experience, that *medicated* frictions, or the introduction of the most active medicines into the human system, by rubbing them in properly on the surface, might be attended with the most happy effects, especially in all chronical diseases. Common sense appears to have long since pointed out this excellent method of administering medicines, even to the Indian savages, though it is little practised in enlightened Europe, where the stomach is doomed to be the field of battle, for deciding commotions and irregularities in our complicated frame. But who is hardy enough to maintain, that the digestive organ was by Nature destined to be the *exclusive* vehicle of drugs, and to serve as their common laboratory?

FRIDAY, the sixth day of the week, so called from **Frea**, or **Friga**, a goddess worshipped by the Saxons on this day.

FRIGATE, among seamen, a ship of war, light built, and a good sailer. A frigate has commonly two decks, whence that called a light frigate, is a frigate with only one deck.

FRINGILLA, in ornithology, a comprehensive genus of birds, of the order of the passeres, with the beak of a conic sharp-pointed figure, the two chaps of which mutually receive each other. To this genus belong the gold-finch, the chaff-finch, green-finch, yellow-hammer, canary-bird, linnet, sparrow, &c. The canary-bird was originally brought from the Canary-islands; first known in Europe about the end of the fifteenth century; and not bred in that part of the world till about the middle of the seventeenth. Their naturalisation appears to have originated in accident. A vessel which was carrying, among other commodities, a number of these birds to Leghorn, was wrecked on the coast of Italy; and being thus set at liberty, they flew to the nearest land, which was the island of Elba, where they found the climate so favourable that they multiplied, and would probably have become domesticated had they not been caught in snares. It seems that the breed, thus introduced, has long been lost. At Ymst, there is a company which, after the breeding-season is over, send out persons to different parts of Germany and Switzerland to purchase birds from those who breed them, each agent commonly returns with three or four hundred birds, which are afterwards carried for sale not only through every part of Germany, but also to England, Russia, and even Constantinople. About sixteen hundred are sent yearly to England, where the dealers, notwithstanding the expenses they have incurred, and after having carried them on their backs, perhaps a hundred miles, sell them at a few shillings a-piece.

FRIT, in the manufacture of glass, is the principal material in the business, a saline substance drawn from the ashes of the plant kali, or from other plants, mixed with sand or flint, and baked together, makes an opaque substance called frit.

FRIZE, in commerce, a kind of woollen cloth or stuff, frized or napped on one side.

Frizing *of Cloth*, a term, in the woollen manufactory, applied to the forming of the nap of a cloth or stuff, into a number of little hard burrs or prominences, covering almost the whole ground thereof.

FROG, or *Rana*, L. a genus of amphibious reptiles, consisting of 17 species, the most remarkable of which are:

1. The *temporaria*, or Common Frog, which is an animal so well known as to render any description unnecessary. Some of its properties, however, are very singular; its power of leaping is extraordinary, and it swims better than any other quadruped. Its body is na-

ked, and without any tail: the fore limbs are very lightly made, while the hind legs and thighs are remarkably long, and furnished with strong muscles. As soon as the spawn is vivified, the future frog becomes a tadpole, in which state it is wholly a water animal; but as soon as it is changed into a frog, and attains its proper shape, it immediately migrates to the shore.

These animals adhere closely to the backs of their own species, as well as to those of fishes. It has been remarked that they will even destroy pike; and it is certain that they materially injure carp, by fixing their hind-legs to the back of those fish, while their fore-legs are fastened to the corner of each eye; so that the carp become much exhausted, and frequently sink under the weight of so disagreeable a companion.

2. The *esculenta*, or Edible Frog, differs from the former species, only in having an high protuberance in the middle of the back, which forms an acute angle. Its colours likewise are more vivid, and its marks more distinct, the ground colour being a pale or yellowish green, marked with rows of black spots from the head to the rump. Both this and the preceding species are, according to Mr. PENNANT, used as food, though rarely in this country.

As an article of luxury for the table this species of frog is in great request in France, Germany, and other countries of the continent of Europe. They are generally caught in the autumn, by rakes with long close-set teeth, by nets, and in numerous other ways. Some persons amuse themselves by catching them with lines and hooks baited with insects, worms, &c. At this season they are collected in thousands, and sold to the wholesale dealers who have large conservatories for them. These are holes dug in the ground to the depth of four or five feet, covered at the mouth with a board, and over this in winter with straw. We are informed by Dr. TOWNSON that at Vienna, in the year 1793, there were only three great dealers in frogs; by whom most of those persons were supplied who carried them to the markets for sale.

The parts that are eaten are chiefly the hind quarters.

In America the species called *Bull-Frogs*, which sometimes measure eighteen inches and upwards in length from the nose to the hind-feet, are not unfrequently adopted as food.

FROST, is that state of the atmosphere, which causes water and other liquids to congeal, or freeze: or it is that state of the natural world in which the atmosphere so absorbs the caloric from bodies on the surface of the globe, as to leave them, more or less, without fluidity or expansion.

It appears that water and other fluids are capable of containing caloric in two very different states. In the one, they seem to imbibe it in such a manner that it eludes all the methods by which it is customary to observe it, either by our sensation of feeling, or by the thermometer; in the other, it manifests itself obviously to the senses, either by the touch, the thermometer, or the emission of light.

In the first of these states, the body is called *cold;* but here we are not to suppose a *total* absence of heat or caloric: for even those fluids that are coldest contain it in a very considerable proportion. Thus vapour, which is colder to the touch than the water from which it was raised, has in its composition an immense quantity of caloric, even more than sufficient to heat it red hot. The same may be said of common salt, and of snow or ice. If a quantity of each of these substances be separately reduced to the degree of 28 or 30 of Fahrenheit's thermometer, upon mixing them together, the heat which would have raised the thermometer to that degree, now enters into their substance in such a manner that the mercury falls down to 0. Here an excessive degree of cold is produced; and yet the substances contain the very same quantity of heat that they did before the mixture; for they absorb it from all bodies around them; and if water in a small vessel be placed in them, they will so draw out its caloric as to reduce it to a mass of ice.

It seems, therefore, that the senses, even when assisted by thermometers, can only judge of the *state* in which the caloric is with relation to surrounding bodies, without regard to its quantity. Thus, if the caloric flows from any part of our bodies into any substance actually in contact with it, the sensation of cold is excited, and we call that substance *cold;* but if it flows from any substance into our bodies, the sensation of heat is excited, and we call that substance *hot;* without regard to the absolute quantity in either case.

In cold countries, the frost frequently proves fatal to mankind, not only producing mortification, but even death itself. The hands of those unfortunate persons, who die in consequence of intense cold, are first seized, till they lose the sense of feeling; next a drowsiness pervades the whole body, which, if indulged in, is attended with imperceptible dissolution.

If animation is suspended from severe frost, the following will be the external symptoms: rigidity of the whole body; and inflexibility of the limbs, which continue in the same posture as the frozen person had adopted during the unfortunate accident; the teeth are closed; froth sometimes issues from the mouth; there is a total insensibility to all stimulants, and the extremities are partly mortified, and, in some instances, spontaneously separate.

Notwithstanding these unfavourable appearances, every exertion ought to be instantly made to restore life, if possible, by strictly adhering to the following directions; because there is a greater probability of recovering such persons, than those deprived of life, in consequence of drowning or suspension by the cord.

No external warmth of any kind must be applied to frozen persons, till the internal or vital heat be excited; when the former also should be carefully and very gradually adapted to the manifest degree of the latter. Hence the whole process should be performed either in the open air, or in a cold room; the body cautiously carried in a posture somewhat erect, to the nearest dwelling; the head turned gently towards the right side; and the clothes carefully taken off, without injuring the skin, or bending the limbs. These precautions are necessary, as a rough treatment may easily occasion dislocations of the joints, or fractures of the bones. Next, the whole naked frame, excepting the face, should be covered with snow from twelve to eighteen inches in thickness; or, if this cannot be procured, cold water may be substituted, and cloths successively dipped in it may be spread over the whole body, especially the head and breast. After continuing these affusions, gentle frictions with flannel or soft brushes, likewise immersed into cold fluids, should be commenced; persevering in these attempts for an hour at least, when the body ought to be left undisturbed for some minutes. If no signs of life appear, clysters of cold water, with oil and vinegar, or six ounces of brandy, are to be given, and the former process again and again repeated; so that five or six hours sometimes elapse, before any symptoms of animation are perceptible. As soon, however, as there is the least prospect of recovery, *warm* fomentations must gradually be resorted to; the degree of friction cautiously increased; or the patient placed in bed between two robust persons; emollient clysters prepared; and, when he is able to swallow, a cup of tea with a little vinegar, wine, or brandy, may be allowed. In many desperate instances, however, it will perhaps be proper to perform venesection, to introduce air into the lungs by means of common bellows, or those described in p. 76 of this volume, or to have recourse to the electrifying machine, or the earth bath, &c. but such cases must be submitted to the judgment of the profession.

Mr. ETON, in his account of the Turkish Empire, relates the success which attended the Russian application of goose-grease to frozen limbs after the battle of Ochakof, even when the parts were perfectly black. The parts were kept constantly covered with the grease. The fat of common fowls is a domestic remedy in the United States for the same complaint. The simplicity of these remedies ought not to prevent our using them.

FRUIT, in general, includes whatever the earth produces for the nourishment and support of man, and other animals; as herbs, grain, hay, and corn. —Fruit also implies an assemblage of seeds in a head, as in a ranunculus; and all kinds of seeds, or grains, whether inclosed in a cover, capsule, or pod; and whether bony, fleshy, skinny, or membranous.

The structure and parts of different fruit differ in some things, but in all the species the essential parts of the fruit appear to be only continuations or expansions of those which are seen in the other parts of the tree; and the same fibres are continued to them from the root. An apple, cut in two transversely, will be found principally composed of four parts: 1. A skin, or rind, which is only a continuation and expansion of the outer bark of the tree. 2. A parenchyma, or pulp, which is an expansion and intumescence of the blea, or inner bark of the tree. 3. The fibres, or ramifications of the woody part of the tree. 4. The core, which is the produce of the pith of the wood, indurated, or strengthened by twigs of the woody fibres intermixed with it. This serves to furnish a proper lodging for the seeds, and filtrates the juices of the parenchyma, or pulp, and conveys them to the seeds.

In plums, cherries, &c. there are four parts, viz. a coat, parenchyma, ramification, and stone. The outer part, or shell of the stone, seems formed of the calculous part of the nutritious juice of the plant; and the inner part, or kernel, of the pith of the tree, derived thither by seminal branches, which penetrate the base of the stone. The acorn consists of a shell, cortex, and medulla: the shell consists of a coat and parenchyma, derived from the bark and wood of the tree. The cortex consists of an inner and outer part, the first of which is a duplicate of the inner trunk of the shell; the second is a softer substance, derived from the same source as the parenchyma of the shell: but authors are not agreed whether the medulla, or pulp of the kernel, arises from the pith of the tree, or from the cortical part.

Berries, grapes, &c. contain, besides three general parts, viz. coat, parenchyma, and ramification, grains of a stony nature, which are the seeds.—Fruits, in the economy of nature, are useful in guarding, preserving, and feeding the inclosed seed.

FRUIT-TREES, are such as bear fruit, namely, Apple, Cherry, Pear-trees, &c. for the particular culture of which we refer to those articles. At present, we shall confine ourselves to remarks equally applicable to orchards, and to single trees.

While young, no tree should be suffered to bear a large quantity of fruit; and, if they abound with blossoms, the fruit should be gathered as soon as it is formed; leaving only half a dozen of the produce, to ascertain its size and quality. By this measure, the trees will not only produce larger and finer fruit, but, by being kept clear, the leading and collateral branches will every year become more vigorous. Nor ought any young plant, or newly-engrafted tree, to be permitted to *run mop-headed*, as it will make no progress, till each branch has acquired a determined leader: for, if the growth of a tree be prevented, it will be extremely difficult to throw such energy into the system, as to enable it to grow freely.

As long as fruit-trees continue in the nursery, it will be requisite to cut down the head, in order to give strength and symmetry to the stem: it will also be useful to shorten most of the grafts, lest they should be blown out by the wind: these operations likewise contribute to swell the buds.

The ingenious Mr. Bucknall particularly recommends, not to place the rows of trees in a situation either directly north or south, but rather inclining to the east, as the sun will then shine upon them in the early part of the day during the spring, and thus dissipate the vapours collected in the night; which, if suffered to condense, will stint the fruit in the earlier stages of its growth. He farther observes, that if the *shaws* (or shades) be properly attended to, the trees being placed in this position, will be enabled to withstand the power of the winds; nor will they be affected by blight. The *shaw* will also protect the fruit from the autumnal winds, by which half the crop of fruit is not unfrequently blown down, before it is ripe; and, as the heads are at that season of the year laden with fruit and leaves, many trees are torn up from the ground, or so lacerated as to be completely spoiled; a misfortune that might be effectually prevented by a proper disposition of the shades.

Although gardeners bestow the strictest attention on orchards, it sometimes happens that the bark of trees is stripped off by sheep, or by other accidents. In this case, it has been recommended by Mr. W. Fairman, of Miller's House, Lynsted, Kent, to take off the arms of such trees as are damaged; to cut slips of the rind, about two or three inches in width, and to place four or five of them perpendicularly round the naked part. The damaged rind is previously to be cleared away, the sound bark somewhat raised, and the slips inserted beneath it, to promote the circulation of the sap. These dressings are next to be bound very tight with rope-yarn; and a composition of loam and cow dung, together with a small proportion of drift sand, should be applied, over which some old sacking, or similar stuff, ought to be fastened. Mr. Fairman adds, that he made an experiment with this mode of treatment, in the spring of 1794, on some trees which had been much damaged by sheep, and that it completely succeeded, the slips adhering closely, and being full of sap.

Fruit-trees, like the rest of the vegetable creation, are the prey of a variety of insects, of which few are more destructive than those infesting apple, pear, cherry, oak, white-thorn, and similar trees. They deposit their black eggs in clusters, resembling withered leaves, and which are twisted by a cobweb round the uppermost branches.—These notorious insects are hatched in the spring, when they assume the form of very diminutive caterpillars, which destroy every thing before them, and rapidly propagate in the most unfavourable weather. They damage oaks very materially; devour the white-thorn, and kill the plant: apples and pears, likewise, receive great injury. The only remedy hitherto known of exterminating such noxious vermin, is to cut off all the twigs or shoots of every tree on which these nests of insects appear; to collect them in a heap, and burn them as soon as the weather will permit; for where this necessary operation is deferred till the summer approaches, the insects increase prodigiously, and commit irreparable damage. See CATERPILLAR and INSECTS.

[Burn rags dipped in brimstone, and tied to a pole under the nests of caterpillars. *Query*, if it would not be worth while to try the fumes of chlorine gas? See FUMIGATION.—T. C.]

Before we conclude this article, we shall briefly observe, 1. That the cutting and pruning of young fruit-trees retard their bearing; though such necessary operations contribute to the richness and flavour of the fruit, as well as to the beauty of the tree. 2. That those plants which produce kernels, yield fruit later, but in greater abundance than *stone-fruit* trees: the time for bearing required by the former being upon an average five years. 3. That stone-fruit, figs, and grapes, generally yield abundantly at the expiration of three or four years; bear full crops in the fifth and sixth years; and, if judiciously managed, will continue to produce for several seasons. 4. That the fruit of wall-trees in general, attains to maturity sooner than that growing on standards; and the fruit on the latter earlier than that produced by dwarfs. 5. That wall-trees should be sheltered from the north-west winds in our northern and middle states.

The following directions for picking, preserving, and packing fruit for carriage, we insert on the authority of Mr. FORSYTH.

"All apples, pears, &c. ought to be carefully gathered by hand, and laid in baskets containing dried grass, to prevent them from being bruised; and if they fall spontaneously, some dry straw should be prepared for their reception on the ground: in the latter instance, the fruit ought to be separated from, and sent to the table before that which is collected by hand; and such as may be accidently bruised, ought to be reserved for culinary purposes; because it cannot be long kept in a sound state.

When all the fruit is collected, it should be conveyed to the store-room; laid gently in small heaps, on dried grass; and their tops be covered with short grass, in order to *sweat*. Here it may remain for about a fortnight; during which time each apple, pear, &c. must be occasionally wiped with a dry woollen cloth, and those exposed on the surface should be placed towards the middle of the heap. At the end of this period, all watery ingredients that may have been imbibed during a wet season will be evaporated: the heaps should then be uncovered, and each article carefully wiped; separating those which may be injured, or unfit for keeping. During this process of sweating, the windows of the store-room, excepting in wet or foggy weather, ought to be continually open, in order to discharge the moisture perspiring from the fruit.

The usual method of storing apples, pears, &c. consists in laying them on clean wheaten straw; but in this case, it will be necessary to examine them frequently, and to remove such as begin to decay; because the straw, by absorbing moisture, will become so tainted as to communicate an unpleasant flavour.

Another mode of preserving fruit, is that of depositing it on shelves made of well-seasoned white deal, and covered with coarse thin canvas, on which the articles are to be laid, after being wiped perfectly dry: a piece of linen cloth, or thin flannel, or whitish-brown paper, must then be placed on the top, with a view to exclude the air, and to guard against the injurious effects of frost. Farther, it should be turned several times during the winter; because the more tender and delicate kinds are apt to decay on the lower side, if they remain long in a quiescent state; even though they may have been completely sound when first selected for that purpose.

In the vicinity of the metropolis, where fruit is kept in store-houses for supplying the markets, it is generally packed in soft paper, disposed at the bottoms and around the edges of baskets or hampers: a layer of fruit is then put in, and covered with sheets of paper; after which successive strata of fruit and paper are placed regularly, till the vessel be full. The top is then provided with three or four double folds of paper, both to exclude the air and frost. Every sort is arranged in distinct baskets, to which labels are affixed, containing the name of the fruit, and the period when it will be fit for use."

The best mode of preserving fruit, however, in the opinion of Mr. Forsyth, is that of packing it in glazed earthen jars, which ought to be kept in dry apartments. For this purpose, apples and pears are to be wrapped separately in soft paper, and laid at the bottom of the vessel on a thin stratum of well-dried bran: alternate layers of bran and fruit are then to follow, till the jar be filled; when it should be gently shaken, in order to settle its contents. Every vacancy must now be supplied with bran, covered with paper, and the whole secured from air and moisture by a piece of bladder, over which the cover of the vessel must be carefully fitted.

With respect to the packing of fruit which is to be conveyed to a considerable distance, there cannot be taken too great precaution. Boxes should, therefore, be made of strong deal, and of various sizes, in proportion to the quantity they are designed to contain: these will be proper for melons wrapped simply in paper; and also for pears, peaches, nectarines, plums, and grapes, being enveloped first in vine leaves, and then in paper; but for cherries and currants, flat tin boxes will be required. If the fruits last mentioned are to be carried, successive layers of fine long moss, and cherries, ought to be arranged, till the box be full; so that, when the lid is closed, they may be in no danger of being injured by friction. For transporting melons, &c. similar strata of dried moss, and short, soft, dry grass are to be formed, in which the fruit is to be stored according to the manner above directed; being selected as nearly of the same size as possible: care also must be taken to place the largest at the bottom, and to fill up every interstice. For the sake of farther security, each box ought to be provided with a strong lock and two keys; so that the persons packing and unpacking the fruit, may be respectively in the possession of one. The moss and grass should always be returned in the boxes; and, with a little addition, they will serve the whole season, provided such materials be shaken up, and well aired, after each journey; in order that they may remain sweet. Lastly, it will be necessary to cord these boxes firmly, with a view to prevent any accidents that may arise during their conveyance. If this method be carefully pursued, it will certainly be attended with success; for, Mr. Forsyth observes, that fruit thus managed, may be sent with perfect safety, either by coaches or wagons, to the remotest part of the kingdom.

[Apples should be wiped dry and kept in a dry cellar of uniform temperature on shelves in the dark. Or fruit may be kept in jars with the cuttings of paper from bookbinders, intermixed. Grapes in particular may be thus kept. —T. C.]

Observations of Dr. Darwin on the means of *increasing the number of fruit buds, and of enlarging and perfecting fruit*. See also article Bud.

1. *To increase the number of Fruit Buds.*

"The terms strength and weakness, in their usual acceptation, when applied to the vegetation of trees, are metaphorical expressions, or denote the effect of consequence, rather than the cause of their bearing leaf-buds or flower-buds, as spoken of in *Phytologia*, Sect. IX. 2. 7. For the production of leaf-buds or flower-buds, though it may be said to accompany the greater or less vigour of a tree, depends on the facility or difficulty, with which the long caudexes of the new buds, which constitute the filaments of the bark, can be generated.

"Thus the new vegetable production formed in the axilla of a leaf about Midsummer, which is called a leaf-bud, consists of many embryon buds, perhaps twenty or thirty, which are to form the next year's shoot; and each of these must be furnished at the same time with a long caudex in miniature, extending from the leaf or summit to its radicle or base; which consists of umbilical vessels for its vernal nutriment, and of a continuation of other absorbent vessels, and of arteries and veins, as described in *Phytologia*, Sect. VII. 1. 7. which passes along the branches and trunk, from the apex or leaf of the bud in the air, to its base or radicle in the ground; and which thus forms the new bark, and contributes to thicken and strengthen the trunk and branches of the tree; because each new leaf-bud with its summit, caudex, and radicle, continues afterwards to adhere to the parent tree.

"But the production in the axilla of a leaf, which is called a flower-bud, or fruit-bud, consists only of an individual vegetable with the rudiments of a number of flowers, with one caudex for its growth and nutriment; for as the seed falls from the tree, when ripe, no new apparatus of caudexes in miniature for each individual seed, as for each individual embryon-bud, is required to pass down the trunk into the ground to form a new bark; and thus to thicken and strengthen the trunk and branches.

"Add to this, that not only the seeds require no new caudexes to pass down the trunk, but that probably the stamina and coral of each flower strike their roots only into the blood-vessels, which communicate with the bractes, like mosses or fungusses, which grow on trees, or like cuscuta, (dodder) viscum, misletoe, and tillandsia, and epidendrum; and therefore require no caudexes and radicles to pass down into the ground.

"Whence it appears that by rendering it more difficult for new buds to acquire new caudexes along the branches or trunk from the summit into the ground, the tree will be necessitated to produce flower-buds in preference to leaf-buds; a theory which was first delivered in the *Botanic Garden*, vol. i. canto 4. l. 470, note, and explains the whole art of the management of fruit-trees.

"Vegetables therefore in respect to their mode of propagation are either viviparous or oviparous. The live progeny of vegetables consists in the buds, which rise on their branches in the bosom of each leaf, or on its long caudex extending down the bark of trees; or which arise on the bulbs, knobs, wires, or scions, from the broad caudex on the roots of herbaceous plants. The egg-progeny of vegetables consists in their seeds, with the previous apparatus of the flower, and concomitant nutriment in the fruit and cotyledons. And as plants, or parts of plants are said to be in greater vigour when the viviparous progeny is prevalent; as the caudexes of this adherent offspring form a new bark, and thence thicken and strengthen the trunk and branches; and to be in less vigour when the oviparous progeny is prevalent; as the seeds fall from the tree, and consequently require no caudexes to form a new bark, and thence to thicken and strengthen the tree. We shall generally use the word viviparous instead of vigorous, when applied to vegetables, which *generate leaf-buds principally;* and *oviparous* instead of *weak*, when applied to vegetables, which generate flower-buds principally; for the words vigorous or weak may properly express the greater or less health of vegetables in both these situations.

"The following methods will contribute to prevent the young buds from so readily acquiring new caudexes on the trunk of the tree; and will therefore retard the generation of leaf-buds, and consequently assist the generation of fruit-buds; and should be executed about Midsummer, or soon after, as at that time the new buds are formed.

"1. *The first method consists in bending the viviparous branches to the horizon, which converts them into oviparous ones,* for by the curvature of such branches the bark will be compressed on the under side, and extended on the upper side of the curve, and its vessels on both sides will be contracted in their diameters, and thus the difficulty of producing new caudexes for the generation of embryon leaf-buds will be increased, in whatever state of miniature they may be conceived to exist.

"A curious fact seems to be established by the experiments of Dr. WALKER in the first volume of the *Edinburgh Transactions*, which shews, that the bending of a branch even below its insertion into the trunk does not impede the ascent, or derivation of the vernal sap-juice into it; but on the contrary, that it rather appears to assist it, resembling in some measure a capillary syphon, as mentioned in *Phytologia*, Sec. III. 2. 4. which may be owing to the vernal sap-juice ascending principally, or entirely, in the sap-wood, as appears by the new leaves expanding to a certain degree on decorticated oak-trees, as shewn in Sect. IX. 2. 8. And as the vessels of this alburnum are more rigid, they may be less liable to contraction or coarctation by bending down the branch, than the bark-vessels, as well as from their being placed within the latter, and therefore less liable to compression beneath the curvature, and to elongation above it.

"Whence it appears that the bending down a branch of a fruit-tree below the horizon does not diminish the nutriment of the fruit-buds, but rather increases it; as Dr. WALKER observed these buds to grow sooner and larger at the extremities of the bended branches than on other parts of equal height.

"It was asserted by Mr. LAWRENCE, that the more the branches of any tree are carried horizontally, the more apt that tree is to bear fruit; and that the more upright or perpendicular the branches are led, the more disposed is that tree to increase in wood; which he ascribes to the bending down of the branches impeding the circulation of the sap—*Art of Gardening*. Mr. HITT in his *Treatise on Fruit Trees*, affirms, that if a vigorous branch of a wall-tree be bent down to the horizon or beneath it, it loses its vigour, and becomes a bearing branch; and therefore recommends his method of nailing the branches of wall-trees, and of tying those of espaliers, in a horizontal direction or still lower; as in this constrained situation there must occur greater difficulty, I suppose, in the production of the new caudexes, necessary for the embryon progeny of buds, upwards or horizontally along the bended branch, contrary to their natural habits, as well as from the compression of the bark beneath the curvature of the branch, and its extension above it; whence more flower-shoots are produced, which do not require new caudexes to pass along the bended branch; but which permit their progeny, the seeds, to fall upon the earth, and penetrate it with their new roots.

"In Lord STAFFORD's gardens at Trentham, I remember to have seen many years ago some standard dwarf apple-trees with all their branches bent down, and fixed on a slight frame-work about a foot from the ground; which seemed to be uncommonly prolific, as a circle of white and purple flowers, twenty feet in diameter on branches radiated from a centre, appeared to a distant eye like a lunar halo, or a carpet of rich embroidery.

"The greater production of fruit-buds on branches bended to the horizon must contribute, I should suppose, to the prolific effect of training nectarine and peach trees on tiles laid on the ground, or on the gentle declivity of a bank of earth facing the south, which has lately been recommended by some one, whose name I do not recollect, who gained a patent for his discovery. And it is indeed probable, that both these modes of training fruit-trees, one of which may be called an horizontal wall-tree, and the other an horizontal espalier, would repay the labour of the horticultor; as they would be exposed to a more vertical sun in summer, which might more certainly ripen their fruit; and would be kept somewhat backwarder in the early spring, by the greater obliquity of the sun-beams, and might be therefore less liable to injury from the vernal frost; and when in blossom might easily be covered in the night, when necessary, by mats thrown over them supported by stakes with horizontal poles on them.

"2. Secondly. *The twisting a wire, or tying a waxed string round the viviparous branches of a tree, induces them to become oviparous*, as observed by Mr. WHITMILL, who bound not only the viviparous shoots of various wall-trees with strong wire, but also some of their large roots, and thus increased the product of his fruit. BRADLEY *on Gardening*, vol. ii. p. 155. And M. BUFFON produced the same effect by a tight cord round the branches, which previously produced leaf-buds instead of flower-buds. *Act. Paris. ann.* 1783.

"M. BUFFON concludes from the above experiments, that an engrafted branch bears fruit more copiously, and more certainly, from its vessels being compressed by the callus around the ingrafted junction, which may have this effect, and at the same time contribute, by preventing the luxuriant growth of its leaf shoots to render the tree of more dwarfish stature. I am informed, that many dwarf apple-trees, which are now planted in garden pots both in France and England, bear much fruit, and are elegantly placed in the centre of a dessert at luxurious tables; and that the principal art of producing them consists in ingrafting them three or four times, scion on scion; so that the stem is compressed by the callus of three or four ingraftments before the branches are permitted to divaricate; and the trees are thus rendered beautiful dwarfs.

"The effect of thus compressing the bark by a wire, or a cord, or by the callus round the junctures of the ingrafted scions, is undoubtedly accomplished by the increased difficulty opposed to the production of the caudexes, for each new embryon leaf-bud, as above explained, and the consequent generation of the flower-buds instead of them.

"3. Thirdly. *The wounding, or breaking a viviparous branch, or cutting away a ring of the bark, as of pear-trees, or a semi-cylinder of the bark of other fruit-trees, induces them to become oviparous.*

"Where young trees discover too great vigour, Mr. LAWRENCE advises to cut the most vigorous shoots two parts in three through, leaving a large notch, that the wound may not heal too soon; which he adds will both render them fruitful, make them more readily conform to the wall or espalier, and preserve such as are dwarfs from too much aspiring in very strong branches, especially of pears; he recommends two or more such incisions to be made in the same branch.

"Another method he proposes, is to break the too vigorous branches half through with the hand, which he has practised with success, in apricots and peaches, when the branches were formed directly forward from the wall, and these branches have continued several years to bear fruit, though some have occasionally died by effusing gum; and though these incisions and breaking the branches may be performed at any time of the year, he prefers the spring on account of the wet or frost of winter. *Art of Gardening*.

"A complete cylinder of the bark about an inch in height was cut off from the branch of a pear-tree against a wall in Mr. Howard's garden at Litchfield, about five years ago: the circumcised part is now not above half the diameter of the branch above and below it, yet this branch has been full of fruit every year since, when the other branches of the tree bore only sparingly. I lately observed, that the leaves of this wounded branch were smaller and paler, and the fruit less in size, and ripened sooner than in any other parts of the tree; and another branch has the bark taken off not quite all round with much the same effect.

"The theory of this curious vegetable fact receives great light from the foregoing account of the individuality of buds. A flower-bud dies when it has perfected its seed, like an annual plant, and hence requires no place on the bark for new caudexes to pass downwards; but on the contrary leaf-buds, as they advance into shoots, form new buds in the axilla of every leaf; which new buds require new caudexes to pass down the bark, and thus thicken as well as elongate the branch. Now if a cylinder of the bark be destroyed, many of these new caudexes cannot be produced; and thence more of the buds will be converted into flower-buds.

"In this curious circumstance, the caudexes of the buds of the tree above the decorticated part seem to have emitted short radicles into the alburnum; the vessels of which must thus have acted as capillary tubes between the upper and lower caudexes of those buds; as capillary tubes will raise water by the attraction of their internal surfaces nearly to their summits, when they are not too high in proportion to their diameter; but water will in no case flow over their summits, but will always stand with a concave surface below the uppermost rim of the tube, in which situation it may readily be absorbed by vegetable radicles; and may be supplied from beneath, by the sap-juice raised by the vegetable action of the absorbent vessels of the caudexes, whose radicles terminate in the earth.

"It is customary to debark oak trees in the spring, which are intended to be felled in the ensuing autumn; because the bark comes off easier at this season; and the sap-wood, or alburnum, is believed to become harder, and more durable, if the tree remains till the end of summer. The trees thus stripped of their bark put forth shoots as usual with acorns on the sixth, seventh, and eighth joints, like vines; but in the branches I examined, the joints of the debarked trees were much shorter than those of other oak-trees, the acorns were more numerous, and no new buds were produced above the joints, which bore acorns. From hence it appears, that the branches of decorticated oak-trees produce fewer leaf-buds, and more flower-buds. And secondly that the new buds of debarked oak-trees continue to obtain moisture from the alburnum after the season of the ascent of the sap in other vegetables ceases; which in this unnatural state of the debarked tree may act as capillary tubes, like the alburnum of the small debarked cylinder of a pear-tree above mentioned; or as the vessels of the alburnum may not yet have lost their vegetable life, they may continue to absorb sap-juice or water from their radicles, and carry it to the buds at the summits by their spiral contractions as in the bleeding season.

"The parts of a tree immediately below a decorticated or a strangulated branch or root will generally become viviparous, and will thence be said to be increased in vigour; that is, it will produce new leaf-buds, and those of a luxuriant appearance; because the injury of the bark of the branch or root will prevent the parts above from receiving so much of the nutritive sap-juice, as in their sound state; and consequently the parts beneath will possess more of it; and also because these new buds are generated from a lower part of the caudex, and will thence be a few years before they will acquire that maturity, or puberty, which is necessary for the generation of flower-buds, or the production of a sexual or seminal progeny; whence by strangulating or decorticating the alternate branches of a pear-tree they will bear for six or eight years; and the other alternate ones will become in the same time strong and vigorous, ready to undergo a similar operation, when the former cease to be of other use; but the fruit will become smaller in size, though in greater number and ripen earlier in the season.

"In the same manner new root-scions are said to be produced by strangulating a branch of a root near the surface with a tight string, or by slitting a root near the trunk, (*Evelyn's Sylva*;) as in these cases the ascent of the sap-juice is impeded, and the part below becomes viviparous, or produces new leaf-buds for the reasons mentioned in the last paragraph; as is frequently seen where the end of a branch is lopped, or beneath the scar of the junction of an ingrafted scion. On the same account it is not uncommon to ingraft with success on roots taken out of the ground, and afterwards replanted; as the robinia on the root of acacia, and any other apples on the roots of the suckers of bur-apple, or codling. See *Phytologia*, Sect. IX. 3. 5.

"For the same reason the roots of some plants, which are otherwise not easily propagated, will shoot up buds; if a part of them next the stem of the plant be half cut through, or raised out of the ground, and exposed to the air; as in pyramidal campanula, and geranium lobatum. And for the same reason the lateral branches of numerous shrubs, as well as of herbaceous plants, will put forth roots, when they are bent down into the ground, if they are previously wounded to prevent the free supply of the vegetable nutriment in its usual course, as in laying carnations, dianthus.

"A method of converting the viviparous branches of pear and apple-trees into oviparous branches is described by Mr. Fitzgerald in the *Philosophical Transactions*, vol. lii. and seems to be superior to the exsection of a cylinder of the bark above mentioned; as the alburnum is not left naked after the operation. In the month of August, he made a circular incision round the principal branches of several pear-trees, apple-trees, plum-trees, and cherry-trees, near the stems of each, through the bark. About 3 or 4 inches higher he then made another incision round the bark, and then a perpendicular one, joining these two circular ones, and separated the cylinder of bark nicely from the wood, covering it, and the bare part of the wood from the air, for about a quarter of an hour, when the wound began to bleed. He then replaced the bark with great exactness, and bound it round rather tightly with bass, so as to cover the wound entirely, and half an inch above and below the circumcisions.

"In about a month the bark began to swell above and below the bandages, he then unbound them, and found the parts quite healed. He rebound them slightly with bass, and let them remain so till the beginning of the next summer, when he again took off the bandages, and found them all healthy, and every one of them bore plentifully that season, though it was in general reckoned a scarce fruit year.

"He treated two young pear-trees in this manner, which never had yet had any bloom; on one of them he operated on the main arms, and on several of the less branches from those main arms; and on only one of the main arms of the other. The first, he says, bore a surprising quantity of fruit in the next summer; and the circumcised arm of the other bore a moderate quantity; though no other part of the tree had any appearance of bloom.

"Mr. Fitzgerald afterwards took a cylinder of the bark from the branches of two young apple-trees about the same size, as exactly as he could, by measure; and changing them, bound them each on the other tree. The bark of one had a leaf-bud and two apples growing on it; the barks of both of them healed perfectly, the leaf-bud put forth leaves, and the apples remained on and ripened: and both the branches bore so plentifully, that one broke with its load, and it was necessary to prop the other.

"Mr. Fitzgerald further observes, that he changed cylinders of the bark with equal success of nectarine and peach-trees; and that the branches thus operated upon were retarded in their general growth; which coincides with the idea of repeatedly grafting one scion above another on the apple-trees designed for dwarfs to be set in garden pots, as described in No. 2. 2. of this section.

"4. *The transplanting a viviparous fruit-tree, or destroying some of its roots before Midsummer, or the confining its roots in a garden-pot, or on a floor of bricks beneath the soil, will induce it to become oviparous.*

"Mr. Knight, in his treatise on the culture of the apple and pear, p. 83, has the following passage: "In the garden culture of the apple, where the trees are retained as dwarfs or espaliers, the more vigorously growing kinds are often rendered unproductive by the excessive, though necessary, use of the pruning knife. I have always succeeded in making trees of this kind fruitful by digging them up, and replacing them with some fresh mould in the same situation. The too great luxuriance of growth is checked, and a disposition to bear is in consequence brought on." The same observation was made by Mr. Lawrence, who took up trees which were too vigorous; that is, which produced viviparous buds instead of oviparous ones, and replanted them to render them fruitful. *Art of Gardening*. Lond. 1723.

" In transplanting trees for any purpose, it may be observed, *that they should not be replanted deep in the soil*, since the most nutritive or salubrious parts of the earth are those within the reach of the sun's warmth, of the descending moisture, and of the oxygen of the atmosphere. And as the root-fibres of trees, like those of seeds, always grow towards the moistest part of the soil, as the young shoots and leaves grow towards the purest air and brightest light; it follows, that the root fibres seldom rise higher in the ground than they were originally set, and seldom elongate themselves even perfectly horizontally: so that when a fruit-tree is planted too deep in the earth, it seldom grows with healthy vigour, either in respect to its leaf-buds or its flower-buds.

" This curious effect cannot be produced by generally debilitating the tree from its want of due nourishment; because it is said to succeed best in very good soil, or by the addition of new garden mould, as before directed; but by rendering more difficult the production of radicles from the caudexes of the embryon leaf-buds; which descend to the finest ramifications of the old roots, and elongate themselves beyond the extremities of their ultimate fibrils; a great number of which roots being torn off by transplantation, or compressed in a garden pot, the production or progress of many of the new radicles must be impeded or prevented; and the numerous caudexes of new leaf-buds be in consequence formed with greater difficulty, whence an increased tendency to generate flower-buds.

" For the same reason if beans, *vicia faba*, which are but a few inches high, be transplanted, they do not become so tall, but they flower and ripen their seeds sooner; because they cannot so easily generate new leaf-buds. The same occurs in frequently transplanting brocoli, *brassica;* the plant does not grow so tall, but has earlier flowers, and in greater number; and it is hence better to pluck them up, than to dig them up, for the purpose of replanting them; as by that means more of the root-fibres are torn off, and the plants become almost totally oviparous.

" It is well known, that the vessels of animal bodies are less liable to bleed, when they are torn asunder, than when they are cut with a sharp instrument; as their diameters are contracted, or their internal surfaces brought into contact with each other, in the act of extending them, till they break. Thus if the navel-string of new born animals is cut instead of torn, they are liable to bleed to death; and there is a remarkable case of a miller's servant,* who had his arm and shoulder bone, or scapula, torn off in a windmill without much loss of blood. This is mentioned to shew, that it may also be better to tear up roots, which are transplanted for this purpose, than to dig them up; as they may thence effuse less vegetable blood, and in consequence be less weakened by the operation

" In transplanting strawberries, many of the roots being torn off, fewer leaf-buds, and consequent wires, are produced from the difficulty, which their embryon caudexes find in producing new radicles over the old ones to supply nutriment to the wires, till they bend down and protrude roots into the ground at their other extremities, whence a greater number of flower-buds are generated; on this account the roots of strawberries should generally be transplanted, or new ones from the wires should be cultivated, every third or fourth year, to prevent the too luxuriant growth of their wires; or a similar difficulty of producing wires or leaf-buds may be effected by crowding the roots of strawberries together, as some gardeners recommend; but I suppose by these means the fruit may become smaller from scarcity of nutriment, though more numerous.

" A floor of bricks, or of stone, extended about two feet deep beneath the roots of wall-trees, has been practised in some gardens from an idea, that the roots shot themselves too deep into some unwholesome stratum of earth; and it has been observed, that the trees became better fruit-bearers. In some situations it is possible, this might be the cause of the new prolific property of the trees; but I suspect it has occurred generally from the difficulty opposed to the number and elongation of the root-fibres, and consequently to the generation of the new caudexes of the embryon leaf-buds; whence a greater production of flower-buds ensued.

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* See Cheselden's *Anatomy*.

"5. *If the central viviparous branches of a plant be cut away or shortened, the lateral ones will sooner or more completely become oviparous.* 1. There are many very small buds on the lower parts of large branches, which do not seem to grow to maturity, and in consequence produce neither new leaf-buds nor new flower-buds. There are other lateral shoots on many trees, which only push out a few inches, and are called spurs, and which bear fruit the succeeding summer at their extremities. In many other plants the lateral branches are oviparous, except at the extremity, which is terminated with a viviparous bud; while the central branches continue long to generate only a viviparous progeny, as in *vines* and *melons*.

"The first of these, or the unprolific existence of the buds at the bottom of large branches, may be owing in part to their feeble efforts of pullulation from the want of sufficient sunshine and ventilation; and also in part, like the spurs, and other lateral branches, to the difficulty they encounter in producing the embryon caudexes of new leaf-buds along the trunk; which is already occupied by those of the more vigorous vegetation of the central branches, which possess a great share of sunshine and ventilation.

"But the principal cause, which renders the spurs and lateral branches oviparous, results from the resistance the embryon caudexes of leaf-buds experience by the curvature of the lateral branch, where it joins the trunk, and the consequent coarctation of its vessels, added to the difficulty every lateral bud has to encounter from its own curvature at its exit from the parent twig; on which last account the central bud at the extremity of an oviparous branch is generally viviparous, because it has not any curvature at its exit. All this corresponds with the fact above described, that when the viviparous arms of wall-trees are bent down to the horizon, they become oviparous.

"2. What then happens in all these situations when the central parts are cut away or shortened? First the dwarf-buds at the bottom of these large viviparous branches, which are in part cut away, will find more room to push down the embryon caudexes of new leaf-buds; and will produce a viviparous progeny; and those at the bottom of oviparous branches, which are shortened by cutting off their viviparous extremities, will also now pullulate, and produce flower-buds for the succeeding year, owing to the derivation of some of that nourishment to them, which would otherwise have been expended on the summit-bud. Secondly, the spurs will generate an oviparous progeny, but will require more nutriment, because all the vessels of plants inosculate, and will thence produce larger fruit, and more certainly ripen it. Thirdly, the other lateral branches will receive more nourishment, and become more vertical, and will thence find less opposition to the production of the caudexes, both of the flower-buds and leaf-buds; either of which may become stronger or more numerous according to the greater or less inclination of the branches to the horizon; and both of them may be more vigorous properly speaking; that is, they may become larger leaf-buds, or larger flower-buds, than others of the same tree.

"3. Thus in the management of MELONS, which would grow into branches much too extensive for the artificial glass-frames of our climate, and would not have time to ripen their later fruit in our short summers; it is necessary first to check the vigour, properly so speaking, of the whole plant. This is done by washing the seed from the ripe fruit, which should naturally contribute to nourish it; and keeping the seed four or five years, that the mucilaginous nutriment deposited in the cotyledons may also be in some degree impaired; it is also probable, that confining the roots of melons and cucumbers in garden pots, if they were well supplied with nutriment, warmth, and water, might be advantageous for this purpose.

"Secondly, as soon as the leaf appears an inch in diameter, experienced gardeners pick out the central bud, which causes an oviparous, though a more vigorous, lateral shoot; which therefore sooner bears fruit, and that of a larger kind; as it acquires more nourishment from the destruction of the central one.

"And as these lateral branches are liable to produce other viviparous shoots at their extremities, after they have generated lateral flower-buds, it again becomes necessary to pinch off the viviparous extremities of them, not only to accommodate them to the size of the glass-frame, but also to supply them with more nutriment, which would otherwise have been expended on the viviparous summit.

"The central bud, or summit, of the lateral branches, is generally viviparous, as well as of the central branches; because the embryon caudexes of its new offspring are opposed in the production along the bark by only one curvature at the insertion of the branch into the trunk; whereas the lateral buds of the lateral branches have the progress of the embryon caudexes of their new buds opposed by two curvatures, one of the bud to the branch, and another from the branch to the trunk.

"The lateral branches of many mature trees, though they bear flower-buds on their sides, are generally terminated with a leaf-bud, as above explained; but it happens in some of them, and particularly to vines, that after two or three flower-buds are produced on a lateral branch, that it shall proceed to grow in length, and to produce leaf-buds at every joint above the flower-buds, as well as at the summit; which may be thus perhaps satisfactorily explained. After the third, and fourth, and fifth joints of a new lateral shoot have generated flowers, which require few or no more caudexes; room enough is left on the bark of the shoot for those above them to acquire the numerous new miniature caudexes of embryon leaf-buds, and where the new caudexes of embryon buds can easily be produced along the bark, and sufficient nutriment is supplied; all vegetables are more liable to propagate themselves by buds than by seeds.

"3. *To Perfect and Enlarge the Fruit.* It is believed by some of the Linnæan school, that flower-buds or leaf-buds may be converted into each other in the early state of their existence, as mentioned in *Phytologia*, Sect. IX. 2. 8. It is indeed probable, that either a flower-bud or leaf-bud may be generated instead of each other reciprocally, before either of them exists; but after either of them has obtained a certain degree of maturity, so as to be distinguished by its form being more pointed or more spherical; I suspect no addition or detraction of nutriment, or of the facility of the production of its embryon caudexes down the bark and radicles beneath can change its destination.

"1. *Shorten the oviparous branches, when the leaves fall off, by pruning their viviparous summits, and cut away the root-suckers.* The summits of the lateral branches, as well as the erect ones, are furnished generally with viviparous buds; which in many wall-trees should be cut off, after the leaves fall in autumn; that more nutriment may be derived to the fruit-buds, which may occasionally become somewhat enlarged during the milder days of winter; as they are now certainly too far advanced to be changed into leaf-buds; and if this pruning be deferred till late in the winter months, the flower-buds will not be quite so forward, as if it be performed earlier. For the same reason the root-suckers also should be cut away in the autumn, that all the nutriment, which they would otherwise expend, may be derived to the flower-buds, and induce them early to enlarge themselves.

"2. *Pinch or rub off all useless viviparous buds in the spring or summer, as they occur.* In those trees where the fruit-buds arise on the new leaf-shoots along with the leaf-buds, and cannot therefore be sooner distinguished or approached, as in figs and vines, the summit leaf-buds should be pinched off two joints above the fruit-buds, as soon as they appear, that more nutriment may be conveyed to the fruit-buds.

"And in the hardier wall-trees, the new leaf-buds, which appear during the spring and summer months in wrong places, where they cannot be trained properly against the wall, or where they are too numerous, should be rubbed or pinched off, as they occur; whence more nourishment will be derived to the ripening fruit, and to those new leaf-buds which are to remain to produce future flower-buds.

"And if the new buds, which are seen in their young state in the axilla of the leaves of the new shoots, were picked out by the point of a knife, or pinched off, where they grow long enough for that purpose, as the secondary shoots of vines in grape houses are pinched; it might probably induce those eyes to produce flowers in the succeeding year, as spoken of in *Phytologia*, No. 2. 5. of this Section, as well as contribute to enlarge the present fruit by the expenditure of less nutriment on the leaf-buds, an idea well deserving the test of experiment.

"In the same manner, in the cultivation of melons and cucumbers, after the central bud is pinched off, as mentioned above, *Phytologia* No. 2. 5. the viviparous extremities of the lateral branches should be also destroyed, as soon as a sufficient number of female flowers are impregnated; that a greater share of nutriment may be derived to them, instead of crowding the frame with new branches, whose fruit-buds would be too late to ripen in our short summers.

"3. *Thin all those fruits, which are too numerous; pluck off apricots, peaches, gooseberries; and cut out many grapes from each branch with scissars.* By the inosculation of the vessels of vegetables, when any parts of a tree are destroyed, those in their vicinity become more vigorous. On this account, when part of the fruit is taken away as early as may be, the remaining part acquires more nutriment. Add to this, that, where the fruit is crowded, some of it becomes precluded from the sun and air, and in consequence does not perfectly ripen, and is liable to become mouldy; for mucor is a vegetable production, which, like other fungi, does not require either much light or air, as appears from the growth of some fungusses in dark cellars, and of common mushrooms beneath beds of straw.

"4. *Prevent the production of new leaf-buds.* In some pear trees, the whole of the blossoms become steril, and fall off without any apparent injury from cold, and this for many successive years. The same occurs sometimes to chesnut trees, *æsculus pavia*, after the flower the fructification entirely falls off; some of these might be male flowers, as MILLER observes, but the whole could not be such. The same happens very frequently to the fig trees of this climate, sometimes the whole crop falls off, when they are about the size of filberts; that is, while they are still in flower, which, though concealed within the fig, must precede the swelling of the seed, whether these be impregnated or not.

"A correspondent fact occurred to me a few years ago. I had six young trees of the Ischia fig, with fruit on them, in pots, in a stove. On removing them into larger boxes, the figs fell off, which I ascribed to the increased vigour of the plants; as they protruded very vigorous shoots, occasioned by the accumulation of new soil round their roots. Perhaps these plants might rather be said to have been in flower than in fruit, and perhaps these flowers were all male ones only, or accompanied only with imperfect female ones?

"Whence I conclude, that about the season when the corals of these flowers with their stamens and stigmas die, the trees generate and nourish too many new leaf-buds, owing to the facility with which they can produce the new caudexes of these young buds down the bark; and that by the whole of the vegetable sap-juice being derived to the new buds for their present growth, or to form reservoirs for their future growth, the pericarp and seeds, whether impregnated or not, are deprived of their due nutriment and fall off.

"Hence I propose to tie waxed thread or fine wire round the twigs of pear trees, which have usually miscarried, as soon as they are in flower, so as to compress, but not so as to strangulate them; or to wound the bark by a circular or semicircular incision, which might counteract their facility of procreating new leaf-buds; which I suspect would be more effectual in preventing the flowers from falling off, than pinching off the new leaf-buds, as they appear; which is recommended by Dr. BRADLEY, in the management of fig-trees, and is done to vines in hot houses; but which I found to be ineffectual on many fig branches, both in the natural ground and in pots, and ascribed its failure to the continuance of the efforts of the fig tree to produce new leaf-buds; whereas in vines, I suppose, the grapes would ripen, whether the new leaf-buds remain or are destroyed. See *Phytologia*, No. 3. 2. of this Section.

"PONTEDERA observed, that in the islands of the Archipelago, some fig trees bear in the spring many male flowers, and few female ones, the former of which fall off; and that they bear a second crop, chiefly of female flowers, in the autumn, which ripen in the ensuing spring—*Anthologia*. Can this occur in the fig-trees of this country?

"Other figs are said not to ripen, but to fall off before their maturity, unless they be wounded by insects in their caprification, or punctured by a straw. A further investigation of this subject is much wanted to propagate figs with success in this climate. See *Botanic Garden*, vol. ii. note on caprificus. See also MILNE's *Botan. Diction.* Article Caprification.

"5. *Give additional moisture, manure, and warmth, during the early part of the growth of fruit.* By additional moisture the fruit becomes larger; in hot houses this may be effected two ways, one by watering the earth on which the vegetables grow, and another by producing steam by watering the warm flues or floors; which will afterwards in the colder hours be again condensed, and settle in the form of dew on the fruit and leaves.

"By supplying vegetables as well as animals with an abundancy of fluid, they are liable to increase in bulk, both because the external cuticle, which confines the growth of both of them, becomes relaxed, as is seen in the hands of those women, who have many hours been employed in washing; and also because the cutaneous absorbent vessels will thus imbibe more fluid from the external surface; and the cellular absorbents will therefore imbibe less from the internal cells, and consequently more mucus or fat will remain in them.

"Thus in Lancashire, where premiums are given for large gooseberries, I am told, that some of those who are solicitous for the prizes, not only thin the fruit of a gooseberry-tree, so as to leave but two or three gooseberries on a branch, but then by supporting a tea saucer under each of these gooseberries, bathe it for some weeks in so much water as to cover about one fourth part of it, which they call suckling the gooseberry.

"There are two circumstances to be attended to in giving water to plants; which are, not to water them during the hot part of the day in summer, nor in the evenings of spring, when a frost may be expected; in both these circumstances we may be said to copy nature, as rain is generally preceded by a cloudy sky, and is never accompanied by frost; though that sometimes follows it, and is then very injurious to vegetation.

"When plants have been long stimulated by a hot sunshine into violent action, if this stimulus of heat be too greatly and too suddenly diminished by the affusion of cold water, or by its sudden evaporation, their vessels cease to act, and death ensues; exactly as has too frequently happened to those, who have bathed in a cold spring of water after having been heated by violent and continued exercise on a hot day. When severe frosts follows the watering of plants, they are rendered torpid, and die by the too great and sudden diminution of the stimulus of heat; which is equally necessary to the activity of vegetable as to animal fibres; and in some instances the circulation of their fluids may be stopped by the congelation of them; and in others their vessels may be burst by the expansion attending the conversion of water into ice; or, lastly, by the separation of their different fluids by congelation.

"When an addition of manure can be procured, as where the black carbonic juice from a dunghill mixed with water, or soapsuds, which have been used in washing, can be employed instead of water alone; it must undoubtedly add to the nutriment, and consequently enlarge the size of the fruit by that means also, as well as by the additional water.

"6. *Protect the early flowers and the late fruits from frost.* The vernal frosts are very pernicious to the early blossoms of apples and pears, and of all the tender wall-trees; various contrivances have been used to shelter them, as mats suspended before wall-trees; which in Denmark are said to be used to shelter them from the mid-day sun, as well as from the night frosts, both to prevent them from flowering too early, and being thence exposed to severe frosts; and because vegetables suffer more from great cold, as well as animals, after having been exposed to great heat, as explained in *Phytologia*, Sect. XIV. 2. 2.

"Those parts of vegetables, which are most succulent, suffer most from frost, as the young tops of tender trees, as of the ash, fraxinus, and weeping willow, salix babylonica; and also all other vegetables, after having been exposed to much moisture, as to rain or dews; which probably may occur in part from the greater sensibility of the tender juicy summits of the present year's growth, and partly from the expansion of their frozen juices, which may burst the containing vessels.

"From some experiments in a late volume of the *Philosophical Transactions*, it appears, that very much more rain was caught in glasses placed on the ground near a high church, than was caught in similar glasses on the roof of it; which evinces, that a much greater quantity of moisture exists in the lower parts of the atmosphere, and is precipitated from it, than from the higher parts: whence to protect the blossoms more effectually from the descending dews coping boards might be placed at every two feet or less above each other, with their front edges pointing upwards to the meridian sun in March, and ledges nailed on the back edges to convey the rain or dews towards the central part of the tree, where by another cross ledge at the end of each board it might be carried from the wall.

"A similar inconvenience from autumnal frosts affects some of the late fruits, as figs and grapes, which might also receive advantage from replacing the coping boards in the autumn.

"Another method of effectually guarding against the vernal frosts, and also the autumnal ones, is by building the garden walls with fire-flues in them, which is now frequently practised.—There is one secret necessary to be known, and well attended to, in the management of fire-flues; and that is in the first place to plant trees, which will open their flowers about the same time, against the same flue, and then diligently to observe not to put fire into this flue, till the trees, it is designed to assist, are in flower; since if the fire be applied sooner, the flowers are forwarded, and in consequence exposed to more danger from the severer frosts.—One friend of mine, who diligently attends to this circumstance, assures me, that he never fails of producing a plentiful crop of excellent fruit.

"And it is possible that one use of covering apricot trees, before they flower, from the mid-day sun, which is said to be practised in Denmark, may be to protract their time of flowering, and thus expose them to less danger from frost, as well as to prevent their irritability from being exhausted by the heat, and thus causing the night air to be more injurious to them.

"7. *Fruits may be sooner ripened by wounding them, or by gathering them.*—The wounds inflicted by insects on many fruits, promotes their more speedy ripening, as well as those inflicted by caprification, mentioned in *Phytologia*, Sect. XIV. 3. 3. and in No. 3. 4 of this Section. It is said that cutting the stalk of a bunch of grapes half through, which has acquired its due size, will expedite the ripening of it; because it will then be supplied with a less quantity of new juices, and the change of its acerb juices into saccharine ones, which is partly a chemical, and partly a vegetable process, proceeds more rapidly. See *Phytologia*, Sect. X. 8. 1. On the same account the pears on a branch which has had a circle of its bark cut away, will ripen its fruit sooner; and those annual plants, which are supplied with less water than usual, both flower sooner, and ripen their seed sooner.

"To which may be added, that gathering pears from the tree before they are ripe, and laying them on heaps covered with blankets, is known considerably to forward their ripening, by something like a chemical fermentation added to the living action of the fruit, which advances the saccharine process with greater rapidity.

"I have seen apricots at table, which I was informed were plucked from the tree, and kept some days in a hot house, and thus became deliciously ripe; in the same manner as harsh pears ripen almost into a syrup during twelve or twenty hours baking in a slow oven; which occasioned the jest of a French traveller, who on being asked on his return, what good fruit they had in England, answered, that the only ripe fruit he happened to taste was the baked pear.

"IV. THE ARTS OF PRESERVING FRUIT, as they depend on the prevention of the chemical processes, which produce their dissolution, ought to be here mentioned.

"As life, whether animal or vegetable, prevents putrefaction, and as many fruits exist long after they are gathered from the tree, before they become ripe and die spontaneously, and in consequence putrefy, as crabs, sloes, medlars, and austere pears. The art of preserving these consists in storing them, where the heat is neither much above or below 48 degrees, which is the temperature of the interior parts of the earth; that is, in a dry cellar, or beneath the soil, or well covered with straw or mats in a dry chamber. As greater heat might make them ripen sooner than they are wanted, by the increased activity of their vegetable life; and frost by destroying that life; would subject them to putrefy, when they become thawed; as perpetually happens to apples and potatoes, which are not well defended from frost. And lastly, the moisture would injure them many ways; first, by its contributing to destroy their vegetable life; secondly, in promoting the chemical process of putrefaction; and thirdly, by its encouraging the growth of mucor, or mould, which will grow in moist situations without much light or air.

"Too great warmth destroys both animal and vegetable life, by stimulating their vessels into too great activity for a time, whence a subsequent torpor from the too great previous expenditure of the living power, which terminates in death. After the death of the organisation, a boiling heat coagulates the mucilaginous fluids, and if continued would, I believe, prevent the chemical fermentation of them; and that thus both vegetable and animal substances might be preserved. The experiment is difficult to try, and could not therefore be of much practical utility if it should succeed.

"Great cold on the contrary destroys both animals and vegetables by the torpor occasioned by the defect of stimulus, and a consequent temporary death. Afterwards if a great degree of cold be continued, in some cases, the expansion of their freezing juices may burst the vegetable vessels, and thus render the life of them irrecoverable. But there is another curious thing happens to many aqueous solutions, or diffusions, which is, that at the time of congelation the dissolved or diffused particles are pushed from the ice, either to the centre, if the cold be applied equally on all sides, or into various cells, as mentioned in *Phytologia*, Sect. XIII. 2. 2.

"This exclusion of salt is seen in freezing any saline solution in water; as common salt or blue vitriol exposed to severe frost in a two ounce phial, are driven to the centre of it. Wine, vinegar, and even milk, may be thus deprived of much of their water. Very moist clay, when exposed to frosty air, shrinks and becomes much more solid according to the assertion of Mr. KIRWAN, *Mineralog.* vol. i. p. 9. the freezing water covering its surface with ice, and driving the molecules of clay nearer the centre. And lastly, the mucilage produced by boiling wheat flour in water, like book-binder's paste, if not too thick, loses its cohesion by being frozen, the water driving, as it freezes, the starch from its chrystallisation; and from this circumstance probably is occasioned the change of flavour of apples, potatoes, and other vegetables, on being thawed after they have been frozen.

"It is nevertheless affirmed, I think, by Mons. REAUMEUR, that if frozen apples be dipped in cold water repeatedly, and the ice thus formed on their surface wiped off, or if they be left in a large pail full of very cold water, so that they may not thaw too hastily, they will not lose their flavour. If this be true, and the apples will keep sound some time afterwards, it would seem that the vegetable life was not destroyed; but that, like sleeping insects, they were reanimated by the warmth; otherwise, if the flavour be not destroyed, and they could be immediately eaten, or used in cookery, it is still a valuable discovery, if true, and might lead us to preserve a variety of fruits in ice-houses, as strawberries, currants, grapes and pines, to the great advantage of society. See *Phytologia*, Sect. XVII. 2. 4."

Dr. JAMES TILTON, of Wilmington, Delaware, communicated to Dr. MEASE the following observations, on the subject of the insect which has been so actively engaged in destroying the fruit of Pennsylvania, Delaware, (and probably of the other states), for a few years past. It were to be wished, that other gentlemen among us, who have opportunities, would be equally attentive with Dr. TILTON, in communicating their observations upon this subject of rural economy.

"CURCULIO, a genus of insects belonging to the *Coleoptera*, or *Beetle* order. The species are said to be very numerous. The immense damage done, by an insect of this tribe, to the fruits of this country, of which there is no similar account in Europe, has given rise to a conjecture with some naturalists that we have a peculiar and very destructive species in America.

"The manner in which this insect injures and destroys our fruits, is, by its mode of propagation. Early in the spring, about the time when the fruit-trees are in blossom, the *Curculiones* ascend in swarms from the earth, crawl up the trees, and as the several fruits advance, they puncture the rind or skin, with their pointed rostra, and deposit their embryos in the wounds thus inflicted. The maggot thus bedded in the fruit, preys upon its pulp and juices, until in most instances, the fruit perishes, falls to the ground, and the insect escaping from so unsafe a residence, makes a sure retreat into the earth: where, like other beetles, it remains in the form of a grub or worm, during the winter, ready to be metamorphosed into a bug or beetle, as the spring advances. Thus every tree furnishes its own enemy; for although these bugs have manifestly the capacity of flying, they appear very reluctant in the use of their wings; and perhaps never employ them but when necessity compels them to migrate. It is a fact, that two trees of the same kind may stand in the nearest possible neighbourhood, not to touch each other, the one have its fruit destroyed by the Curculio, and the other be uninjured, merely from contingent circumstances, which prevent the insects from crawling up the one, while they are uninterrupted from climbing the other.

[Why not tie a rope dipt in tar round the tree, about the time when these insects begin to appear? The tar can be renewed. We strongly recommend the treatise on fruit trees, by Mr. Cox, of Burlington, New Jersey.—T. C.]

"The Curculio delights most in the smooth-skinned stone fruits, such as nectarines, plums, apricots, &c. when they abound on a farm: they nevertheless attack the rough-skinned peach, the apple, pear, and quince. The instinctive sagacity of these creatures directs them especially to the fruits most adapted to their purpose. The stone fruits more certainly perish by the wounds made by these insects, so as to fall in due time to the ground, and afford an opportunity to the young maggot to hide itself in the earth. Although multitudes of seed fruits fall, yet many recover from their wounds, which heal up with deeply indented scars. This probably disconcerts the curculio, in its intended course to the earth. Be this as it may, certain it is, that pears are less liable to fall, and are less injured by this insect than apples. Nectarines, plums, &c. in most districts of our country, where the curculio has gained an establishment, are utterly destroyed, unless special means are employed for their preservation. Cherries escape better, on account of their rapid progress to maturity and their abundant crops: the curculio can only puncture a small part of them, during the short time they hang upon the tree. These destructive insects continue their depredations from the first of May until autumn. Our fruits collectively estimated must thereby be depreciated more than half their value.

"It is supposed the curculio is not only injurious above ground, but also in its retreat, below the surface of the earth, by preying on the roots of our fruit trees. We know that beetles have, in some instances, abounded in such a manner as to endanger whole forests. Our fruit trees often die from manifest injuries done to the roots by insects, and by no insect more probably than the curculio. In districts where this insect abounds, cherry-trees and apple-trees, which disconcert it most above, appear to be the special objects of its vengeance below the surface of the earth.

"We are unacquainted with any tribe of insects able to destroy the curculio. All the domestic animals, however, if well directed, contribute to this purpose. Hogs in a special manner are qualified for the work of extermination. This voracious animal, if suffered to go at large in orchards, and among fruit-trees, devours all the fruit that falls, and among others the curculiones, in the maggot state, which may be contained in them. Being thus generally destroyed in the embryo state, there will be few or no bugs to ascend from the earth in the spring, to injure the fruit.

"The ordinary fowls of a farm-yard are great devourers of beetles. Poultry in general are regarded as carnivorous in summer, and therefore cooped sometime before they are eaten. Every body knows with what avidity ducks seize on the tumble bug, (*Scarabæus carnifex*), and it is probable the curculio is regarded by all the fowls as an equally delicious morsel. Therefore it is, that the smooth stone fruits particularly, succeed much better in lanes and yards, where the poultry run without restraint, than in gardens and other inclosures, where the fowls are excluded.

"Even horned cattle and all sorts of stock may be made to contribute to the preservation of our valuable fruits. By running among the trees, they not only trample to death multitudes of these insects; but by hardening the ground, as in lanes, it becomes very unfit to receive or admit such tender maggots as crawl from the fallen fruits. Besides, the curculio is very timid, and when frightened by the cattle rubbing against the tree or otherwise, their manner is to fold themselves up in a little ball and fall to the ground; where they may be trampled and devoured by the stock, poultry, &c. Col. T. Forrest, of Germantown, having a fine plum-tree near his pump, tied a rope from the tree to his pump-handle, so that the tree was gently agitated every time there was occasion to pump water. The consequence was, that the fruit on this tree was preserved in the greatest perfection.

"All the terebinthinate substances, with camphor and some others, are said to be very offensive to insects generally. Upon this principle, General T. Robinson, of Naaman's creek, suspends annually little bits of board, about the size of a case knife, dipped in tar, on each of his plum-trees. From three to five of these strips are deemed enough, according to the size of the tree. The General commences his operations about the time or soon after the trees are in full bloom, and renews the application of the tar frequently, while the fruit hangs on the tree. To this expedient, he attributes his never failing success. Other gentlemen allege, that common turpentine would be still better: being equally pungent and more permanent in its effects. Some have sown offensive articles, such as buckwheat, celery, &c. at the root of the tree, and have thought that great advantages followed.

"*Ablaqueation*, or digging round the trees, and making bare their roots in winter, is an old expedient of gardeners for killing insects, and may answer well enough for a solitary tree, a year or two; but the curculio will soon recover from a disturbance of this sort, and stock the tree again.

"There is no surer protection against the curculio than a pavement. This, however, is only applicable to a few trees. It may serve in town: but will not answer in the country. Flat stones may however be placed round the tree, and where lime is at hand, they may be cemented.

"Many other expedients, such as smoking, brushing, watering, &c. may be successfully employed, for the protection of a favourite tree or two; but it is manifest, from the preceding history, that a right disposition of stock, especially hogs, among the fruit-trees, can only be relied upon by a farmer, with orchards of considerable extent. And that the stock, poultry, &c. may perform the task assigned them, it is evident, that a proper disposition of fruit-trees is essentially necessary.

"As the smooth stone fruits are the grand nurseries of the curculio, special care should be taken, to have these effectually protected. Unless this can be done, a farmer should not suffer them to grow on his plantation. He will derive no benefit from them; and they will furnish a destructive vermin that will ruin his other fruits. Cherry-trees, nectarines, plums, apricots, &c. should therefore be planted in *lanes* and *hard beaten yards*, or paved yards, the common high-ways of all the stock of the farm, and not beyond the range of the ordinary domestic fowls. Orchards of apple-trees, pear-trees, peach-trees, &c. should all be in one enclosure. The pear-trees and peach-trees may occupy corners of the whole design, so as occasionally to be fenced off. In large orchards, care should be taken that the stock of hogs is sufficient to eat up all the early fruit which fall, from May until August. This precaution will be more especially necessary in large peach orchards: for, otherwise, when the hogs become cloyed with the pulp of the peach, they will let it fall out of their mouths, and content themselves with the kernel, which they like better: and thus the curculio escaping from their jaws, may hide under ground, until next spring. Solitary trees of one fruit or another, remote from the orchard, should be regarded as nurseries of the curculio, and ought to be cut down or removed to the common enclosure. A young orchard should not be planted in the place of, or adjacent to an old one; that it may not be immediately infested with the curculio.

"It is also apparent, from what has been said, that great advantages might result from an association or combination of whole neighbourhoods against this common enemy. Although an intelligent farmer may accomplish much, by due attention, within his own territory, the total extermination of the curculio can hardly be expected, but by the concurrent efforts of whole districts."

On this subject it may be added, that a gardener near Baltimore, who has been successful in raising plums, finds that the insect does most mischief in the night; and hence he shakes the tree every evening, and catches the insect in a sheet placed round it. He always burns them instantly. Wrapping each plum in a muslin bag, or in thin paper perforated with a pin, is a certain, though troublesome mode of guarding against the attacks of these insects.

A machine for paring apples, has lately been invented by Mr. Moses Coates, of Chester county, which on account of its simplicity, and the expedition with which it works, will no doubt come into general use.

As we treat of the general properties, as well as the relative salubrity of fruit, under the individual heads of shrubs and trees, we shall, in this place, only add, that the injudicious practice of promiscuously allowing it, whether ripe or unripe, to children and infants, is very reprehensible. On account of its acidity, they are not able to bear it in excess; and their digestive powers become too frequently impaired at the expense of other secretions; such as insensible perspiration, and the discharges by stool, both of which are thus unnaturally promoted. All fruit given to young people ought to be perfectly *ripe*: mothers and nurses should likewise bestow especial attention on the cleanliness of the peels, or shells, which as they generally pass through different hands, or may have been stored in improper places, require to be previously wiped or washed.

FRUMENTY, or **FURMENTY**, as it is popularly called, is a kind of pottage, prepared of wheat, which is first dried whole in an oven, afterwards boiled up with milk, sugar, and a little spice: it forms a wholesome and nutritive dish.

FRUSH, or **RUNNING-THRUSH**, in farriery, is a discharge of fœtid, and sometimes ichorous matter, from the cleft in the middle of an horse's foot. It affects one, two, and sometimes all the animal's legs; but more frequently appears in the fore-feet. It is occasioned by narrow, concave, or hollow shoes; which, pressing against the fleshy part of the frog, cause pain, inflammation, obstruction of the blood, &c. There are few cases in which the frush admits of a radical cure; because it is subject to frequent returns, producing at length lameness, in consequence of exposing the raw and tender parts to the action of sand, gravel, hard ground, &c.

But, if the disease proceed from contracted, narrow heels, in those feet which are said to be *hoof-bound*, it cannot be cured, without removing the first cause; though even in that case, it will only admit of palliation. In wide hoofs, however, that are open at the heels, and where the complaint is recent, or is suspected to arise from concave shoes, or from keeping the hoofs too hot, dry, and hard, the cure may be effected with ease and safety, by laying aside those shoes; washing the frogs clean after exercise, and dressing them with *Mel Ægyptiacum*, prepared in the following manner: Take 2 oz. of verdigris finely pulverised; 6 oz. of honey, and 4 oz. of vinegar: let the whole be boiled over a gentle fire till it acquires a reddish colour. Or, 1 oz. of blue vitriol, dissolved in a quart of water, may be substituted for the preceding composition, if the hoofs be kept cool and moist. At the same time, it will be requisite to have recourse to bleeding, and purging medicines, which may be repeated two or three times at proper intervals; or, to diuretics, which are preferable, as they may be continued for some time, without confining the horse to the stable. [That is, if the horse be also feverish: not else.—T. C.]

FUEL is the aliment or food of fire.

The fuel generally used in Britain is pit-coal: it is attended with considerable expense, that is not a little increased by the enormous waste, arising from the injudicious manner in which the fires are usually managed. Hence different compositions have been proposed: [but as none of them appear to me applicable to this country, I do not think it necessary to insert them. The economy of fuel depends not on the kind, but on the mode of using it; of which I have given my ideas under the article FIRE: and shall say more under the head of COOKERY.—T. C.]

A patent was granted in June 1798, to Mr. GEORGE BLUNDELL, of Bethnall-green, Middlesex, for his invention of a machine calculated for the purpose of saving fuel, and preventing dirt or dust from fires, which he calls an "*Economical Receiver*." The apparatus consists of certain receivers, or boxes, formed of metal, either simple, or compound, and which are either square, oval, or of any other shape that may be required, in order to be fitted beneath any kind of grates, stoves, or fire-places. Over this receiver is fixed a grating, or net-work of wire, which intercepts the cinders, aud suffers the ashes to fall into the lower part of the vessel. There are likewise sliders, and other pieces of machinery; an explanation of which is inserted in the 10th vol. of the *Repertory of Arts*.

FULLER'S EARTH, in natural history, a soft, greyish, brown, dense, and heavy marle: when dry it is of a greyish, ash-coloured brown, in all degrees from very pale to almost black, and it has generally something of a greenish cast.

This earth is hard, firm, and of a compact texture, but soft to the touch, and neither stains the hands nor easily breaks between the fingers. Its surface is somewhat rough and harsh; it dissolves easily in the mouth; and, in a slight degree, adheres to the tongue. When thrown into water, it does not cause any effervescence, but gradually increases in size, and subsides in a fine soft powder.

The largest stock of the finest fullers'-earth in the world is obtained from the pits at Wavedon, near Woburn, Bedfordshire; where strata of it are found at the depth of ten or twelve feet from the surface of the ground. This earth is also found in abundance, and of a good quality, in certain pits near Brick-hill, in the county of Stafford; near Ryegate, Surrey; Maidstone, Kent; and in the vicinity of Nutley and Petworth, in the county of Sussex.

Incalculable quantities of fullers'-earth are consumed in Great Britain, in the scouring of cloths, stuffs, &c. for which it is of the greatest utility, as it imbibes all the grease and oil used in the preparing, dressing, &c. of wool. For this reason, it is declared to be a contraband commodity, and is prohibited to be exported, under the penalty of one shilling for every pound weight. As an article of domestic economy, it might be more frequently employed than it is at present, especially in the cleaning and scouring of wooden floors and wainscots, being an excellent substitute for soap, of which great quantities are now consumed, and an unnecessary expense of house-keeping thus incurred.

FULLING, is the art of cleansing, scouring, and pressing cloths, stuffs, and stockings, to render them stronger, closer, and firmer: it is also sometimes called *milling*.

The fulling of cloth, &c. is performed by a kind of water-mill, thence called a *fulling*, or *scouring-mill*. Without describing the mechanism of this manufacturing process, we cannot omit to remark, that urine is sometimes employed, as well as soap and fuller's earth, to prepare the stuffs for receiving the first impressions of the pestle. They are first steeped in urine, then in a solution of fullers'-earth and water, and lastly in soap, dissolved in hot water. Soap alone would fully answer this purpose, but it is too expensive, especially as, according to the present mode of dressing, fullers'-earth is of equal efficacy. The *scouring* of cloth, however, is not the only object in fulling it; the alternate pressure communicated by the pestles, or stampers to the stuffs, occasions in its advanced stages an effect analogous to that produced upon hats in the operation of *felting*. Thus, the fibres of wool which compose one of the threads, whether of the warp or the woof, assumes a progressive motion, first introducing themselves among those of the contiguous threads, then into those which follow, so that gradually all the threads, both of the warp and the woof, become completely felted. The cloth, after having by this process become contracted and shortened in its dimensions, partakes in a great measure of the nature of *felt*: hence it may be cut without being liable to unravel; and consequently there is no necessity to hem its edges. Farther, as the threads of both the warp and woof are more intimately combined, the web, which acquires a greater degree of thickness, likewise forms a warmer clothing.

The process of *fulling stockings, caps*, &c. is performed in a manner somewhat different from that in the mills; namely, either with the feet or hands; or a kind of rack or wooden machine, armed with teeth of the same materials; or, which is still better, horses' or bullocks' teeth may be substituted. In this operation, urine, green soap, white soap, and fuller's-earth are employed; but the first of these ingredients is detrimental to the texture. Stockings manufactured in a loom, should be fulled with soap alone; but, for dressing such as have been knit, earth may likewise be added. Lastly, knit worsted is by this process rendered less subject to *run*, if a stitch should happen to drop in the stockings.

FULMINATION, in chemistry, explosion or detonation, accompanied with a very considerable degree of sound. All these equally imply rapid decomposition with or without flame, and the intensity of sound alone distinguishes the idea of *fulmination* from those of *detonation* and *explosion*.

FULMINATING POWDER, a powder that explodes upon the application of certain degrees of heat with instantaneous combustion, and prodigious sound. These are sometimes made with metals, and sometimes without.

FUMARIA, *Cucullaria*, (*Capnorchis*, Dutchman's breeches,) a very singular and handsome plant. The elegantly complex texture of its leaves, of a soft, glacous green colour, together with its racemes of milk-white flowers, having lips studded as it were with gold, give it an air of great softness and elegance. The flower is of singular structure, having two, or rather a double nectary conjoined, resembling a pair of breeches. We have two other species of fumaria, in the United States, both of which are very beautiful plants, viz. f. *glauca*, and f. *fungosa*. The last mentioned grows in the rich vallies of our northern mountains, but on account of its singular elegance, has lately been introduced into our gardens. It is a biennial vine, rambles to a great extent over shrubs during the flowering season. Its foliage is truly elegant, and its tufts of incarnate blossoms excite general admiration.

FUMIGATION, in medicine, denotes the artificial impregnation of the atmosphere, with the fumes or smoke of any vegetable or aromatic substance.

With respect to the fumigation of stables, or other buildings, where cattle are infected with the *distemper*, it has been recommended to put 3 oz. of common saltpetre in a varnished pipkin, upon which are to be poured two oz. of oil of vitriol, diluted with 3 oz.

of water. The vessel is then to be placed for an hour on a chafing-dish provided with live coals, in order that its contents may be heated to a slight degree of ebullition. The whole being safely deposited in the middle of a stable, the vapours are permitted to rise, till the air of the building is saturated. Thus, the malignant miasmata in the air, are supposed to be neutralised, or corrected; but the process ought to be repeated twice in twenty-four hours, at equal periods, during the prevalence of the contagion. [In lieu of this, the antiseptic chlorine gas, recommended by BERTHOLLET, may be used; viz. 3 oz. of common salt, 1 oz. of manganese in powder, and 2 oz. of oil of vitriol previously diluted with an equal quantity of water. Close the doors and windows, and setting the basin containing it in another basin of boiling water, leave the room. It rusts all metals.—T. C.] No good, however, will result from this or any other fumigation, without the frequent admission, and change, of fresh air.

FUNERAL RITES, are those ceremonies which are religiously observed at the interment or burial of the dead. They varied among the ancients, according to the different genius and religion of each country.

It is not, however, our design to specify these ceremonies, but merely to point out an abuse that loudly claims the attention of all. In many populous parishes in Great Britain, a dangerous practice prevails, of excavating pits (graves they cannot be called) for the reception of the poor, who, being *packed* in four deal-boards loosely nailed together, are there deposited, till the whole is sufficiently filled.—During the interval, planks are laid over the common grave; and, when the uppermost coffin arrives, a minister is employed to mutter, at once, the usual prayers over the hapless victims of poverty, who are then covered with the maternal earth. Such mal-practice demands an immediate remedy; as the mephitic vapour arising through the planks, especially during summer, have the most noxious properties; and perhaps many have met with a premature grave, from inhaling those putrid exhalations. Facts like these, we conceive it our duty to state, on account of their immediate influence on the health of every inhabitant.

FUNGUS, in botany, an order of vegetables, extremely different from all others, and belonging to the *cryptogamia* class of LINNÆUS. The fungi have, indeed, so little of the common and general appearance of vegetables, that many have denied them to be such, and contended for their being only excrementous matter, protruded from decaying vegetables of other kind: but, notwithstanding the fungi have neither the colour nor texture of other plants, nor leaves nor flowers like them, yet they must be allowed to belong to the vegetable kingdom, as having absolute and perfect seeds, consisting usually of single antheræ, which produce plants like those from which they are collected.

The fungi are extremely different in figure, and in their manner and place of growth; some growing on the ground, some on living trees, and many on decayed wood; and this, horizontally, or erect. Some are of only a few days duration, others remain for years, and some there are which grow under the surface of the earth in no particular direction. See MUSHROOM, and WHITE SWELLING.

FUR, in commerce, signifies the skins of wild quadrupeds, which are dressed with alum, without depriving them of the hair; and which form a part of the robes of princes, magistrates, and others. The skins chiefly used are, those of the sable, ermine, bear, beaver, hare, &c.

Furs did not become an article of luxury in England for many ages, and were imported principally from Italy, till, since the conquest of Canada and the more northern parts of America, they have been obtained from the Indians.

The furs at present used, are those brought from the remotest parts of North America by the Hudson's Bay Company, and from Russia. They are very valuable, especially the skins of ermines, black foxes, and sables.

With respect to its influence on health, we shall briefly remark, that *fur* deserves no commendation as an article of ordinary dress. Its alkaline and oily particles stimulate the skin, when in contact with it; thus partially increase perspiration, and lay the foundation of colds and catarrhs. A fur dress readily attracts infection, and soon acquires an intolerable smell.—Hence whole nations that wear such garments, are exposed to obstinate cutaneous diseases, and, perhaps, to the propagation of the plague itself: which is said to be spread among the Turks, chiefly by their absurd and cumbersome dresses lined with animal hair.

FURBISHER, a person who polishes or cleans arms; as guns, swords, pistols: an operation which is chiefly performed with emery.

FURLONG, a long measure, equal to 1-8th of a mile, or forty poles. It is also used in some law-books, for the eighth part of an acre.

FURNACE, an utensil, or apparatus, in which a strong fire, either of coals or of wood, may be raised and maintained.

There is a great diversity of furnaces, according to the different purposes to which they are applied. The chief objects in building, and arranging a furnace, are:

1. To confine the heat as much as possible to the matter which is to be operated upon. Hence the fire is usually limited to a cavity formed with that intention, and which is provided with a door for supplying it with fuel, as likewise with a grate for supporting it, and permitting the air to pass through, as well as the ashes to drop down into what is called the *ash-pit*. Thus, the heat is restrained so as to exhaust its force on the subject inclosed.

2. To prevent such heat from being dissipated; which design is effected by simply shutting the door of the furnace, and placing the matter to be acted upon in such a direction as to receive the whole force of the fire, in its passage up the chimney.

3. To produce an intense heat with the smallest possible quantity of fuel. Hence the throat, or funnel of the chimney, is occasionally contracted by a sliding plate or damper, which, when shut closely, prevents the passage of any smoke or air; and, on drawing it out in a greater or less degree, leaves a vent proportionally large or small.—Thus, a large quantity of fuel may be put in the furnace at one time, that will be slowly consumed, and consequently require less attention, than those furnaces which are destitute of this improvement. Where no great degree of heat is required, the sliding plate may be of cast-iron; in some cases, however, fire-clay will be more serviceable; but this contrivance is inapplicable to such furnaces as consume large quantities of fuel, and especially where metals are to be melted.

4. To arrange the whole, so that the degree of heat may be regulated at pleasure; which intention is effected by admitting only a certain portion of air to pass through the fuel.

In June, 1785, a patent was granted to Mr. James Watt, of Birmingham, for his newly-improved method of constructing furnaces of fire-places for heating, boiling, or evaporating water, or other liquids; and also for heating and melting metals, or smelting ores: by which greater effects are produced from the fuel, and the smoke is in a great measure prevented or consumed. The patentee effects these different objects, by closing every passage to the chimney or flues, excepting those left in the interstices of the fuel; by placing fresh fuel above or nearer to the external air, than that which is already converted into coke or charcoal; and by constructing the fire-places so that the flame must pass downwards, or laterally, or horizontally, through the burning fuel, and also from the lower part or internal side of the fire-place, to the flues or chimney. In some cases, Mr. Watt causes the flame to pass through a very hot funnel, or flue, previously to its arriving at the bottom of the boiler, or at that part of the furnace, where it is intended to melt metals; by which contrivance the smoke is still more effectually consumed. In other cases, he directs the course of the flame from the fire-place immediately into the space beneath a boiler, or into the bed of a melting or other furnace. A minute account of this machinery is inserted in the 4th vol. of the "*Repertory of Arts and Manufactures*," where it is described and illustrated by engravings.

The construction of furnaces, so arranged as to consume the whole volume of smoke, is an object which has long engaged the ingenuity of artists. Hence various contrivances have been proposed; but few, we believe, for efficacy and simplicity, can come in competition with that invented by Messrs. Robertsons, of Glasgow. The opening of their furnaces, instead of being closed by a door, consists of a quadrangular hopper or funnel, which is constantly supplied with coals; so that, in proportion as the fuel is exhausted, a fresh stock continually descends through the hopper. Thus, the first combustion, which disengages the greatest part of the smoke and flame, takes place near the mouth of the fire-place, and a considerable quantity of the smoke will, without any other contrivance, be consumed by passing over the red-hot fuel in the farther part of the furnace. But, as a perfect combustion of smoke cannot be obtained without the aid of atmospheric air, a cast-iron plate, about three quarters of an inch above the top of the hopper, is introduced, so that a slit is formed of this depth, and of an equal breadth to the front of the furnace; through which a current of air constantly enters, and is then combined with the smoke. This aperture may be enlarged, or diminished, as occasion may require, by raising or lowering the iron plate, by means of an iron pin: thus, the supply of air may be proportioned to the quantity of smoke produced, and the whole of the latter will be advantageously used, before it can escape through the chimney. See also Boilers and Fire-places.

A full account of Messrs. Robertson's furnace, with plates, may be seen in the 11th vol. of Tilloch's *Philosophical Magazine*, and the 1st vol. of the *Emporium*.

Mr. John Roebuck, of the Devon iron works, Scotland, from the successful result of an experiment continued for several months, was led to be of opinion, that all blast furnaces, by a proper adjustment of such machinery as they are provided with, might greatly and advantageously increase their produce, by assuming this as a principle, viz.—"*That with the giving power, it is rather by a great quantity of air thrown into the furnace with moderate velocity, than by a less quantity thrown in with a greater velocity, that the greatest benefit is derived, in the smelting of iron stones, in order to produce pig iron.*"

[Remember, in all furnaces for smelting, if more air be thrown in, or thrown in so quickly, that the fuel cannot consume it, the metal is again oxided. In all fire-places for boilers, if the air do not pass through a body of heated fuel sufficient to consume it, it will oxide and destroy the bottom of the boiler.—No particle of air undecomposed should be permitted to strike against the bottom of the boiler. Hence the use of interposing a layer of fire stone or soap stone between the fire and the boiler. —T. C.]

FURNACE (Air.) This depends for its great heat on the height of the chimney. For the column of air, of which the chimney is a part, will be light in proportion to that height; and of course, the colder and heavier air will rush through the fire with proportional violence, to restore an equilibrium; and combustion becomes more rapid and intense, the more the air is decomposed.

FURROW, in agriculture, a term not properly defined, as it has three or four distinct significations, namely, 1. The soil turned up by the plough; 2. The trench left by this operation; 3. The interval between two ridges; and, 4. The cross drain which receives the rain-water collected by these intervals. Dr. Johnson adds a *fifth*, but he obviously mistakes furrow for *drill*.

According to Mr. Marshall, there are three ideas which lay claim to the word furrow:—1. The trench made by the plough, which may be called a *plough-furrow;* 2. The collateral drains, or an *inter-furrow;* and 3. The transverse drains, or the *cross-furrow*.

The proper formation and disposition of furrows, is an object of the first importance in tillage, to effect the complete draining of water. Hence, in plain fields, the rain-furrows ought to be drawn according to the declivity of the land: but, in rising grounds it will be most proper to direct them to that side which slightly deviates from the horizontal line.

It also deserves to be remarked, that in all situations where it is practicable, especially at the declivities of fields, reservoirs or pits should be dug, or formed, in order to collect the drained water, together with the finest particles of earth, mire, and other ingredients of manure: after the water has subsided, these valuable materials might be easily obtained in a solid form, and thus again employed on the same field, without incurring the additional expense of carriage. We trust, judicious farmers will avail themselves of this hint.

FUSION, a chemical process, by which bodies are made to pass from the solid to the fluid state in consequence of the application of heat. The chief objects susceptible of this operation are salts, sulphur and metals. Salts are liable to two kinds of fusion, the one, which is peculiar to saline matters, is owing to water, and is called aqueous fusion; the other, which arises from the application of fire, is known by the name of igneous fusion.

FUSTIC, is the wood of the Morus Tinctoria, a tree that grows to a considerable size in the West Indies. It is much used in dyeing yellow, and produces a large quantity of colouring matter.

G.

G, the seventh letter in the English alphabet, but in the Greek and all the oriental languages, it occupies the third place. It is a mute, and cannot be sounded without the assistance of a vowel. It has a hard and a soft sound, as in *game* and *gesture* : as a numeral it formerly stood for 400, and with a dash over it, $\bar{G}$, 400,000. In music it is the character of the treble cleff, and from its being placed at the head, the whole scale took the name Gamut.

GAD-FLY, or Breeze, *Oestrus bovis*, L. an insect with spotted wings and a yellow breast. It has a long proboscis with a sharp dart, enclosing two others within it.

These insects particularly infest oxen, in the backs of which they deposit their eggs, and where the maggots are nourished in the winter, till the month of June: during the whole summer, they plague the cattle by means of their darts to such a degree, that the distressed animals are induced to rush into the water for refuge, till night approaches. We believe that the washing of oxen and cows in the early spring, with a decoction of tobacco, or any other bitter and acrid plant, would greatly tend to prevent the generation of these vermin.

Gad-flies are also very destructive to flowers and trees, the juices of which they absorb; and likewise injure the roots of trees, which, if not timely prevented, they gnaw so severely that the stem will languish, and at length perish. The only remedy hitherto discovered, is to dig up the soil at the foot of such flowers or trees, to kill the insects; and to lay on fresh earth; by which means the plants will be speedily recovered, if they have not been too long neglected.

GADUS, the cod-fish, in natural history. There are 23 species of this genus, the most important is the gadus morhua, or common cod, which inhabits the northern seas of Europe and America, in innumerable shoals, and constitutes an important article of human subsistence. It is of all sizes, and has been known to weigh 60 or 70 pounds. It lives on small fish, particularly on crabs and others of the testaceous kind. It is a very voracious fish; and is so prolific that a million of eggs have been counted in a single roe. Its flesh is a high delicacy, particularly the sound or air-bladder, which is often used in the salted state. Off the coast of Cape Breton, Nova Scotia, and New England, and particularly on the great sand-bank off Newfoundland, this fish is found in inexhaustible abundance.

GALAXY, *milky-way*, in astronomy, that long white, luminous track which seems to encompass the whole heaven like a girdle. This, like every other phenomenon of nature, has supplied the poet with many a fantastic, and many a beautiful dream. The invention of the telescope has confirmed the conjecture of science, that it consists in a multitude of little stars, so remote as to be commingled by the naked eye.

GALBANUM, a gum that exudes from the stem of the *Bubon gummiferum*, L. or Gum-bearing Macedonian Parsley, a native of Persia, and different parts of Africa. The concrete juice is semi-pellucid, soft, and tenacious; of a yellowish-red colour; a strong smell; and a bitterish nauseous taste. The best sort is imported in pale coloured masses, which, when opened, apparently consists of clear white tears. This gum is very little used at present in medicine.

GALE, the Sweet, Sweet Willow, or Dutch Myrtle, *Myrica gale*, L. is an indigenous low plant, growing abundantly on bogs, in gravelly soils, and flowering in the month of May. It is eaten by horses and goats, but not relished by sheep and cows.

This aromatic plant was formerly, by the northern nations, used as a substitute for hops: but unless it be boiled for a considerable time, it is apt to occasion the head-ach. Dr. Withering is of opinion, that from the catkins of this vegetable, if gathered in sufficient quantities, good candles might be manufactured; as, upon boiling those parts in water, a waxy scum may be perceived to rise to the surface. In the currying of leather, especially the softer kinds, this shrub is of the greatest utility. When reduced to powder, it affords a grateful perfume in the composition of ointments; and Bechstein asserts, that it is likewise serviceable for the expulsion of *moths* from cloths.

The sweet gale may be propagated either by seed, or, more speedily, by the divided roots, which thrive in almost every kind of soil, if it be sufficiently watered.

There is another species of the gale, namely, the *myrica cerifera*, from which the inhabitants of Louisiana, South Carolina and Georgia prepare myrtle candles; it is also used for tanning calf skins. See Myrica.

GALEGA, a genus of plants, comprising nineteen species, of which the *G. Virginica*, L. only, will be here noticed. It is called *Virginian goat's rue* or *Catgut*; and is a beautiful plant. This species has a perennial root, which is also long, elastic, and tough: the stem is annual, and grows to a height of three feet. The whole plant is covered with a silvery down. The flowers are red, in spikes at the ends of the branches. The root is used in decoction against worms.

GALENIC, in medicine, that manner of proceeding in medicine which is founded upon the principles of Galen, or which that physician introduced.

GALENICAL MEDICINES, those that are formed by the easier preparations of vegetables; as by infusion or decoction, or by combining and multiplying ingredients; while the chemical, to which they are opposed, are those produced by extracting the more intimate and remote virtues of the substances, through the means of fire and elaborate preparations; as calcination and digestion.

GALL, in natural history, signifies any protuberance, or tumour, produced by the punctures of insects on plants and trees of various kinds; but especially the *quercus*, or oak; *cistus*, or rockrose; *glechoma hederacea*, or ground ivy; *salix*, or willow; *hieraceum*, or hawkweed; *salvia*, or clary; *veronica* or speedwell, &c. Insects deposit their eggs in the leaves or tender branches of plants, the juice of which exudes, and in a short time forms tumours around the punctures or holes. The external coat of this excrescence is dried by the air and during the winter affords a secure shelter to the inclosed insect, while the soft inner pulp furnishes it with sustenance till the spring approaches, when the fly perforates the shell or rind, and departs.

The best of these galls are those found on oak-trees, and which are thence called *oak-galls*; they are deposited by the *cynips quercus gemmæ*, or oak-bud cynips. A small portion of galls infused in a weak solution of green vitriol and water, imparts a purple or violet tint; which, after the whole of the colouring matter is extracted, becomes perfectly black. Considerable quantities of this drug are used in Britain, for the making of ink, dyeing cloths of a black colour, and also for the dressing of leather. The most esteemed galls are brought from Aleppo in Syria, called blue galls.

Galls have an austere styptic taste, without any smell: they are very powerful astringents, and have, therefore, often been employed in medicine. It is asserted that, by their internal use, in doses of half a drachm or more of the powder, intermittent fevers have been cured, even after Peruvian bark had failed.

Gall in sheep, denotes a disorder, with which these animals are affected during the winter, and which is probably occasioned by severe frosts, and scanty food.

Gall is also a general word for acrid substances, and thus is used by St. Matthew for that mixture given to Jesus while on the cross, which St. Mark calls wine mingled with myrrh. It was a custom among the Greeks, Romans, and Jews, to give such bitter mixtures to those condemned to painful deaths, in order to benumb their senses.

GALL-BLADDER, is situated in the concave side of the liver, its use is to collect the bile, first secreted in the liver, and mixing it with its own peculiar produce to perfect it farther, to retain it together a certain time, and then expel it.

GALLING *of a horse's back*, an injury occasioned by heat and the chafing or pressure of the saddle. To prevent this painful affection, it is recommended to take the skin of a hind, well furnished with hair, and exactly fitted under the pannel of the saddle, with the hairy side next the skin of the horse.

When on a journey, a horse's back happens to be galled, a little of the stuffing of the pannel, near the swelled part, should be taken out, and a piece of soft white leather stitched over it to supply the deficiency. Besides, the sore part of the animal's back should be dressed with bruised arsemart (persicaria) the common remedy of travellers in Pennsylvania: but, previous to its application, the injured part must be washed with cold water and soap.

GALLIUM TINCTORIUM, a native plant of North America, possessing the property of dyeing a red, and another kind, a yellow colour.

It has six linear leaves on the stalk, and four on the branches; the stock is flaccid, the peduncles are placed under the flowers, the seeds are smooth, the stalk of the plant is from six to eighteen inches high, the seed vessel is on the top, and comes to maturity in September; the roots are from one inch to two feet long, and when dried, as slender as a common knitting needle; the outside of them is of a dark brown colour, the inside when broken, of a yellow, orange or red colour. It grows plentifully in woods, swamps, and on the banks of rivers, in the middle and back parts of Pennsylvania, in Canada, Hudson's bay, and Western country. The roots of the plant should be carefully dried in the sun, and great precaution taken to preserve them from moisture, that they may not mould.

[They are a substitute for madder, that is, the gallium tinctorium; the *gallium luteum* for the usual yellow drugs.—T. C.]

GALLON, a measure of capacity, both for dry and liquid articles, containing four quarts, which varies according to the nature of the commodity measured. Thus, the wine-gallon contains 231 cubic inches, and holds 8 pounds avoirdupois of pure water; the beer and ale gallon contains 281 solid inches and 10 lbs. 3¼ oz. avoirdupois of water; and the gallon for corn, meal, &c. 272¼ cubic inches, and contains 9 lbs. 13 oz. of pure water.

[**GALL-STONE**, a morbid concretion in the gall-bladder of cattle, used as a yellow pigment for water colours. It can be imitated by inspissating and drying fresh gall.—T.C.]

GALVANISM, an appellation given to the influence of metals, by mere external contact with the human body, discovered by Professor **GALVANI**, at Bologna, about ten years since, and which he called *Animal Electricity*. See VOLTAISM.

Certain convulsive motions on the nerves of living and dead animals, may be excited by the application of metallic or other conductors of electricity; but these motions may also be induced, by simply touching the animal fibre with two different metals, that are brought in contact with each other at the same moment. This surprising phenomenon has lately been resorted to, in order to ascertain whether a drowned, suffocated, or otherwise suddenly deceased person, was really or apparently dead. For this purpose, Dr. CREVE, Professor of Medicine in the *University of Mayence*, has contrived an instrument formed like a bow, both ends of which are furnished with two small round plates. The whole is composed of two parts made of different metals; one-half of solid zinc, the other of fine silver; or gold and zinc, or lead, tin, and gold. The proportion of the first metal should be less than the other combined with it; namely, the weight and size of the zinc-plate should be less than the opposite one of gold. Both plates are only screwed on the bow, which chiefly consists of silver. But, where this instrument cannot be procured on the spur of the occasion, a small piece of tin or lead, and a silver coin of a moderate size, (for instance a shilling, or half-a-crown piece) may be substituted. Although any part of the body may be fixed upon for making the experiment with persons apparently dead, yet the upper arm will be the most proper. The skin, however, in that part where the incision is made, ought to be sound, and not of a gangrenous appearance. The muscles must be cleared of all fat and cellular texture, as far as this be practicable; and the blood is to be taken up by a sponge dipped in water. Next, the muscle should be slightly extended, by stretching the arm; and, in order to keep the lips of the wound separate, the skin ought to be expanded, and the muscular fibres clearly exposed. After these preparatory steps, either the instrument above described, or two loose metallic plates, are to be applied towards the centre of the hollow place or wound made by the incision, and both flat plates brought into perfect contact with the bare muscular fibres. If any irritability exist, or remain, in the system of the subject, the muscular fibres will be contracted and twisted in a manner similar to spasms; or convulsive motions will be evident: every symptom, however, disappears on withdrawing the instrument, and again becomes manifest on re-applying it as before. But no motion whatever will be perceptible, if all irritability be lost or destroyed, in which case the body may be considered as *irrecoverably dead.* In those instances, where persons have been deprived of life by intense cold, a moderate degree of warmth should be previously applied, with a view to render the limbs flexible. Hence, this experiment cannot with propriety be undertaken, till all other means (see Frost,) of restoring animation have been *unsuccessfully* employed.

Whatever two metals be chosen, they will, with a few exceptions, produce those remarkable contractions, when applied in the manner before described; but the most powerful are, zinc and silver, or zinc and gold; or in general, zinc, tin, or lead, when used in combination with gold, silver, molybdena, steel, or copper.

These singular phenomena take place in consequence of a mutual communication between any two points of contact, whether more or less distant, in a system of muscular and nervous organs. The extent of this communication may be considered as a complete circle divided into two parts, one of which, comprising the organs of the animal under the experiment, is called the *animal arc;* the other, which is formed by the metals or *Galvanic* exciters, is denominated the *excitatory arc;* and consists of more than one piece of various kinds.

Beside the effects thus produced on the muscles, the impressions made on the organs of sense are equally remarkable. And as the experiments illustrating them may be easily repeated, we shall specify some of the most interesting. For instance, if a thin plate of zinc be placed on the upper surface of the tongue, and a half-crown, shilling, or silver tea-spoon, be laid on the lower surface of the tongue, and both metals after a short space of time be brought into contact, a peculiar sensation similar to taste, will be perceived at the moment when the mutual touch happens. If the silver be put beneath, and the zinc upon the tongue, the same sensation will arise, but in a weaker degree, resembling diluted ammoniac, from which it in all probability derives its origin.

If a silver probe be introduced as far as convenient into one of the nostrils, and then be brought into contact with a piece of zinc placed on the tongue, a sensation not unlike a strong flash of light will be produced in the corresponding eye, at the instant of contact. A similar perception will result, both at the moment of contact and at that of separation, if one of the metals be applied as high as possible between the gums and upper lip, and the other in a similar situation with the under-lip, or even under the tongue. Lastly, when a probe or rod of zinc, and another of silver, are introduced as far back as possible into the roof of the mouth, the irritations produced by bringing the external ends into contact, are very powerful; and that caused by the zinc is similar in taste to the sensation arising from its application to the tongue.

No method has hitherto been discovered, of applying the galvanic influence in such a manner as to affect the senses of smell, hearing and touch; though several eminent philosophers have carefully investigated the subject. Nor are the *causes* of these phenomena clearly ascertained; Galvani and some of his followers, supposing them to depend on the electric fluid, while others attribute them to the influence of various physical agency.

In this state was Galvanism, when in the year 1800, Signior Volta, professor of Natural Philosophy, at Como, in the Milanese, communicated to Sir Joseph Banks, a discovery of the vast accumulation of this power: it was accordingly presented to the *Royal Society,* from the 2d. part of whose *Transactions,* for 1800, we have selected the following account.

Signior Volta's apparatus consists of a number of copper or silver plates (which last are preferable,) together with an equal number of plates composed of tin, or still better of zinc, and a similar number of pieces of card, leather, or woollen cloth, the last of which substances appears to be the most suitable. These last should be well soaked in water saturated with common salt, muriate of ammonia, or, more effectually, with nitre. The silver or copper may be pieces of money, and the plates of zinc may be cast of the same size. A pile is then to be formed, by placing a piece of silver on a corresponding one of zinc, and on them a piece of wet cloth, or card; which is to be repeated alternately, till the number required be arranged in regular succession. But, as the pieces are apt to tumble down, if their numbers be considerable, unless properly secured, it will be advisable to support them by means of three rods of glass, or baked wood, fixed into a flat wooden pedestal, and touching the pieces of metal at three equi-distant points. Upon these rods may be made to slide a small circular piece of wood, perforated with three holes, which will serve to keep the top of the pile firm, and the different layers in close contact. The moistened pieces should likewise be somewhat smaller than those of metal, and gently squeezed before they are applied, to prevent the superfluous moisture from insinuating itself between the pieces of metal. Thus constructed, the apparatus will afford a perpetual current of the animal-electric fluid, or Galvanic influence, through any conductor that communicates between the uppermost and lowest plate ; and, if one hand be applied to the latter, and the other to the highest metal, a shock will be perceived, which may be repeated as often as the contact is renewed. This shock greatly resembles that given by the torpedo, or *gymnotus electricus* : and, according to the larger size of the metallic plates, the shock will be proportionably stronger. The intensity of the charge, however, is so low, that it cannot penetrate the dry skin ; it will therefore be necessary to wet both hands, and to grasp a piece of metal in each, in order to produce the desired effect : its power may be considerably increased, both by an elevation of temperature, and by augmenting the number of pieces that compose the pile. Thus 20 pieces of each will emit a shock, that is very perceptible in the arms ; if 100 be employed, a very severe but tremulous and continued sensation will extend even to the shoulders ; and, if the surface of the skin be broken the action of the Galvanic influence will be uncommonly painful.

The sensation of a flash, or shock with this apparatus, does not materially differ from that produced by two simple plates ; but it may be effected in various ways, especially if one or both hands be applied in a wet state to the lowest plate of the pile ; or any part of the face be brought in contact with a wire communicating with the top piece. Farther, if a wire be held between the teeth, so as to rest upon the tongue, that organ, as well as the lips, will become convulsed, the flash will appear before the eye, and a very pungent taste will be perceived in the mouth.

Many other curious facts have transpired on this interesting discovery ; but, they have not as yet been applied to medical purposes (though we believe that *Galvanism* may be safely, and perhaps successfully, resorted to, in *paralytic* and other cases, where the muscles require excitement).

[GALVANISM is a series of electrical phenomena, in which electricity is developed without friction, and accompanied by chemical action between some of the bodies employed.

It is supposed to be owing to the evolution of electric matter, by a charge of the electrical states of the metal, and water, or the liquid employed, is the conductor : hence, if between the first pair of plates of copper and zinc, ten degrees of electricity is set free, it is carried by the conducting power of the liquid, to the next pair, where the same process goes on, and so on till it be accumulated at the end of the series, and applied by means of the wires.

To this, the objections are, 1. That no source is pointed out for the continual supply of electric power. 2. No reason is assigned why saline liquors produce so much more effect than water. 3. Nor why the water, as a conductor, should not equalise the disturbed natural proportions. 4. Nor is there any action in vacuo, (3 *Thomp. Ann. of Philos.* 39.) unless an acid be added to the fluid. 5. Why are saline fluids better agents than water, without being better conductors ? Sir H. DAVY allows the action of different fluids are not in proportion to their conducting power. *Phil. Trans.* 1807. 3 *Nich. Jour.* 135. 3 *Thomp. Ann. Phil.* 40.—6 The pile acts before the ends of it are placed in a situation to conduct away the electrical current. 7. How does electricity decompose the interposed fluid ? 8. DE LUC's experiment in 26 *Nich. Jour.* 115. is this : Place a moistened card on the copper ; the copper on the zinc ; then interpose a wire frame : no electricity is produced in this case, as there is when the moistened card is between the metals.

Galvanism is supposed by others to arise from a change in the electrical states of the metals by means of the chemical action of the fluid on them. This seems the most probable opinion, 1st. Because water alone with access of air will act on the metals usually employed. 2. When a metal is oxided, its electrical capacity is diminished, and it gives out electricity to the contiguous fluid, and thence to the next metallic surface; thus, the series may be as follows:—Z (zinc) 100: W (water): C (copper) 100: then Z 90: W: C 110: then Z 110: W: C 100: Z 100: W: C 120: and so on. Hence the effect ought on this view to be increased with increase of series, and increase of chemical action, and it is so. 3. Sir H. Davy's experiments with single plates in *Phil. Trans.* for 1801, p. 397. aid this hypothesis. 4. By Dr. Wollaston's paper in the same volume, it appears (p. 427.) that chemical effects are produced by common electricity, as in the precipitations of solutions of copper and mercury—the change of colour in litmus paper: and also, no electricity can be excited by an amalgam of metals of difficult oxidability, as platinum and gold. The effect of the amalgam on an electrical machine is in proportion to the ease with which the metals can be oxided.

Such are the most probable views of the subject at this time—1819.

It may be observed also: that inflammable substances, alkalis and earths are attracted to the *negative;* acids, oxides, and oxygen, to the *positive* wire.

The electric energy of the pile is different from its chemical, and also from its calorific energy: the first depends on the state of equilibrium and tension of the electric fluid: the second on the conducting powers of the liquid employed: the third on the suddenness and intensity of the chemical action and the size of the plates. Heat most intense, can be produced by a single pair of large plates: chemical action and decompositions are best produced by an extended series of plates of moderate size. The platina wires should dip deep into the liquor.

The best kind of liquor seems to be, water by weight (16 oz. to the pint) one part, common salt one fourth of a part, oil of vitriol one sixteenth of a part. If the calorific effect is wanted, that effect is increased by a small quantity of nitric acid added.

In a series of 500 pair of 4 inch plates, potash, soda, and barytes, are easily metallised: strontia, and lime with difficulty, but they form an amalgam with mercury: so will any ammoniacal salt, as the carbonate.

In my opinion [T. C.] Galvanic fluid is, 1. The basis of caloric. 2. Identical with the nervous fluid. 3. The chief source of animal heat.

1. As to the first point, originally suggested by Sir H. Davy, apply a combustible to the positive end of a Galvanic series; no effect: to the negative end; no effect: bring the wires from the positive and negative ends of the series together; caloric is instantly generated. Again: place a single pair of large plates in a saline fluid that will act on them: as the negative and positive Galvanic electricity cannot be conveyed away in this case, as in an extended series, caloric alone will be generated, and there will be little or no electrical or chemical effect. Why? Because the two electricities are employed and used up in forming caloric. Caloric is therefore a compound formed of the two electricities.

2 and 3. It is identical with the nervous fluid. The nervous fluid (*a*) conveys impressions to and from the sensorium, along the course of the nerves: so does Galvanism. (*b*) is the appropriate stimulus to muscular irritability and contractility: Galvanism can be substituted for it, as by the experiments of Aldini, Dr. Ure, and others; also the experiments of Dr. Wilson Philips in apoplectic, asthmatic, and dispeptic cases. (*c*) The nervous fluid alone gives a healthy character to the secreted fluids of the body: Galvanism produces the same effect. (*d*) Nervous fluid by the experiments of Mr. Brodie, (*Croonian Lecture* for 1810, and *Phil. Trans.* for 1812.) is necessary to the production of animal heat: now, animal caloric, like any other caloric, is formed of the two electricities. So also, the animal caloric depends much on the state of the blood; but the healthy state of the blood depends on the nervous fluid, and Galvanism acts upon the arterial blood in the same manner as the nervous fluid, extricating caloric from it. (*e*) The nervous fluid produces chemical changes in the animal fluids; this also is the effect of the Galvanic fluid. Hence the nervous and the Galvanic fluid in the body, possess the same properties. We know not yet that they possess different ones: in all probability, therefore, they are the same. See *An Inquiry into the Laws of the Vital Functions*, 2d edit. by Dr. Wilson Philips, and his paper in Brande's *Journal of the Royal Institute*, for Oct. 1819, No. XV.

To these considerations I would add, that the human, like every other animal body, possesses a Galvanic series, which is probably the pile of vertebræ composing the spine and its contents, in connexion with the brain. We know that a very powerful Galvanic series, subject to voluntarity, exists in the gymnotus electricus, the silurus electricus, the torpedo, and the fish brought on board the CONGO (1819) from Embomma, on the river Zaire, described in Captain TURKEY's narrative.—T. C.]

Amusing and Simple Experiments in Galvanism.—We know not any science which furnishes more experiments that are both entertaining, amusing and useful than Galvanism.

Experiment 1. Take any small bird, such as a linnet, whose life has been extinguished not more than two hours; place a small piece of silver in its mouth and a small piece of zinc or gold in its tail. Connect the two pieces with iron wire, and the bird will immediately rise up, and expand its wings, and flutter round the room as if alive.

Experiment 2d. Let a person apply a flattened piece of zinc to one of the surfaces of his tongue, and a flattened piece of silver to the other surface, without either of the metals touching each other; but each of them provided with a long iron wire; and by passing the wires in a parallel direction through a door, behind which they are brought together and separated alternately; the person who makes the experiment ascertains by the taste he feels on his tongue, the situation of the extremity of each of the wires.

Experiment 3d. A phenomenon, which fifteen years ago, would have been considered as chimerical, has likewise resulted from the experiments on the Galvanic fluid. It is as follows: A nerve, originally united with several cube lines of muscular flesh, indicates whether two metals are homogeneous or heterogeneous; and whether they are in a state of pure regulus, or in an oxidated state. It also points out whether the coleration of a mineral substance depends on charcoal, or on oxidation which has taken place. The living nervous fibre is consequently a living anthracoscope, a means of discovering charcoal, almost as certain as the hetion of iron, and that of alkalis.

Experiment 4th. Porter drank out of a pewter pot or silver pot, placed upon a server of another metal, has a much stronger taste and richer flavour than when drank without the pot being placed upon a server. If the person which drinks previously moisten his hands with salt and water, the strength and flavour of the liquid will be increased.

Experiment 5th. Tea drank out of China cups with a gold rim, has a richer flavour than tea drank out of cups without a metallic rim.

Experiment 6th. A Galvanic pile or apparatus may be constructed out of vegetables, when metals cannot be procured; thus, for example, three hundred slices of beet, and the same number of horse-radish, placed alternately, will form a pile as strong as fifty pieces of silver and fifty of zinc.

Experiment 7th. Another curious and well established fact, connected with the theory of Galvanism, is, that when a fish, instantly after being taken out of the water, is killed by a violent blow on the head, by which the skull is fractured, the irritability and flexibility of the muscles are preserved much longer than they would have been, if it had been allowed to die with the organs of sensation in an entire state.—So very sensible are the fishermen of this, that they have recourse to the above practice, with a view to render the fishes they catch susceptible for a longer time to the operation called crimping. Salmon is one of the fishes the least tenacious of life, insomuch that after having been taken out of the water, it will cease, in less than half an hour, to manifest any sign of vitality, provided it be not exposed to any violence. But if, on the other hand, it receives as soon as it is caught, a violent blow on the head, the muscles will continue, for the space of more than 12 hours, to exhibit visible signs of irritability.

GAMBOGE, a concrete vegetable juice, of a gummy-resinous nature. It issues from the *Cambogia gutta*, a native of Cambia, in the East Indies; whence it is imported in large cakes or rolls. The best sort is of a deep yellow colour; is divested of all smell; and has very little taste.

As a pigment, gamboge makes a beautiful yellow, which is much used by painters. When taken as a medicine, it operates violently both upwards and downwards. It has been used in dropsies with cream of tartar, or jalap, or with both, to accelerate their operation: it is also recommended to be taken for the expulsion of the tape-worm, in doses of fifteen grains, early in the morning; and, if the worm be not expelled in two or three hours, this powerful dose is said to have been repeated with safety and with success, even to the third time, and in persons of delicate habits. Great precaution, however, is requisite in the use of this precarious and active medicine; but, if accidentally too large a dose of it should have been swallowed, the most effectual antidote will be copious draughts of a solution of pearl-ashes in water.

GAME, in general, denotes any sport or diversion that is performed with regularity, and subject to certain rules.

Games are usually divided into those of *exercise*, such as leaping, playing at tennis, &c. and into those of *hazard*, such as backgammon, &c. which latter ought, in justice to the persons addicted to them, to be completely abolished.

Having already treated of the more active games, under the article EXERCISE, we shall at present only point out such as are peculiarly detrimental to the health of children.

1. *Bending* of the head backwards should be carefully avoided, to prevent young people from tumbling over: besides, the muscles of the abdomen become thus unnaturally extended, and frequently dispose such hazardous adventurers to ruptures.

2. *Jumping* wantonly from, or to, a considerable height, ought to be either prohibited, or undertaken with the greatest caution, in order to avoid violent concussion, and sudden tension of the muscles. The juvenile sportsmen should, therefore, be taught to make such exertions with their knees somewhat inflected, as to reach the ground, first on the points of their toes, and then gradually to drop on the soles of the feet.

3. Children are uncommonly fond of displaying their dexterity in *lifting* one another, and even weights far superior to their strength; a practice that ought to be discouraged: for, while they are in such postures, every nerve is necessarily strained; respiration is impeded; and dangerous accidents may ensue.

4. All *partial exercise* tends to give the body a crooked form, and should therefore be allowed only at certain times, and with moderation; as, under these restrictions, it is even salutary; but if continued to excess, it is attended with the most injurious effects. Hence it would be a judicious measure to teach youth, at an early period, the use of both arms alike, and to make them acquainted with such games as contribute to that purpose.

5. *Sedentary diversions* and long standing, are extremely prejudicial to the straight growth of children; for, as the spinal column and legs are too feeble to support the additional weight of the reclining part of the frame, the vertebræ yield to one side, and often occasion incurable distortions.

If these precautions were more strictly observed, and both male and female children instructed to beware of dangerous postures and leaps, as well as of raising and carrying heavy burdens, many fatal accidents might be avoided.

GAME, among sportsmen, denotes such birds, beasts, or other eatable animals as are taken or killed by fowling or hunting.

GAMING, the art of playing any game of chance; for instance, dice, E O, and Pharo-tables, &c.

Gaming has at all times been regarded as pernicious to the morals of society, and ought therefore to be prohibited under severe penalties. For it leads to avarice, fraud, idleness, and family distress of the most deplorable kind, without one favourable circumstance to recommend it.

GANGRENE, (See MORTIFICATION,) an intense degree of inflammation; in which the part affected grows livid, soft, little sensible, and is frequently covered with vesicles containing ichorous matter. But, when the part becomes blackish, flaccid, easily lacerable, cold, insensible, and emits the smell of putrid flesh, so that the corruption quickly spreads, it is then called *sphacelus*.

Persons of a good habit of body are seldom affected by a gangrene; though, even in them, it may accidentally be induced by contusion, long-continued pressure, or by whatever destroys the texture of a part, and deprives it of its nourishment. Thus, in cold climates, severe frosts frequently occasion this malady, by impeding the circulation. In rheumatic constitutions, especially those advanced in years, the feet are first afflicted with pain, while on the inner side of the small toes, livid spots appear, from which the skin soon separates. By degrees the foot swells, and the toes become mortified.

As soon as there is reason to apprehend, from the unnatural heat of the part affected, and the violence of the fever, that a gangrene will ensue, the patient ought, without loss of time, to apply for professional advice.

GANNET, (*Pelecanus bassanus*,) is a species of pelican so numerous, and at the same time so important to the inhabitants of some parts of Scotland, that in the island of St. Kilda only, more than 20,000 are said to be annually killed by the inhabitants as food. The young birds, however, alone are eatable; and to obtain these and the eggs the bird-catchers undergo the greatest risks. They not only climb the rocks, but even allow themselves to be lowered from the top of the most dangerous precipices, by ropes to the ledges on which the nests are placed. As gannets and their eggs are a principal support to the inhabitants of St. Kilda throughout the year, they are preserved for this purpose in a frozen state in small pyramidal stone buildings covered with turf and ashes.

GAPS, a disease to which poultry are subject. The late Dr. A. Wisenthall of Baltimore, gives the following account of it—*Lon. Med. and Phys. Journal*, vol. ii. "There is a disease prevalent among the gallinaceous poultry in this country, called the *Gaps*, which destroys eight-tenths of our fowls in many parts, and takes place in the greatest degree among the young turkeys and chickens bred upon old established farms. I know not whether the same kind of fowls in England are liable to it, and therefore shall take the liberty to give you a brief account of it.

"Chicks and poults, in a few days after they are hatched, are found frequently to open their mouths wide and gasp for breath, at the same time frequently sneezing, and attempting to swallow. At first the affection is slight, but gradually becomes more and more oppressive, until it ultimately destroys. Very few recover; they languish, grow dispirited, droop and die. It is generally known, that these symptoms are occasioned by worms in the trachea. I have seen the whole of it completely filled with these worms, and have been astonished at the animal's being capable of respiration under such circumstances.

"They are of a reddish colour, and at first view, resemble the human *lumbricus* (or round worm); but when examined, are materially different. When exposed to the microscope, they are found to have an orifice or mouth at one end, formed for function; the other end, as far as I know, imperforated. Through the integuments is seen the intestinal tube, much convoluted, like that of the *lumbricus*.

"No effectual remedy is known against these destructive animals. I have indeed seen them drawn out of the *trachea*, by means of a feather stripped from near its end, which is passed into the *larynx*, and twisted round till it engages one or two of the worms, which are extracted with it."

GARDEN, a piece of ground, laid out, cultivated, and ornamented with a variety of plants, roots, and flowers.

Gardens are generally divided into three classes: 1. The flower-garden; which, being designed both for pleasure and ornament, ought to be in the most conspicuous situation. 2. The fruit-garden, or orchard; and 3. The kitchen-garden, which being calculated for utility, should be planned in more distant situations. The two latter, however, are at present usually combined, as they equally require good soil and exposure.

The principal circumstances that merit attention in the laying out of gardens, are, situation, soil, water, and prospect; the most eligible of which we shall briefly state, referring the reader to the article Kitchen-Garden, for a more particular account of the management of such ground as is designed for the supply of culinary vegetables; and to that of Orchard for the treatment of fruit-gardens.

1. The *situation* ought to be neither too elevated, nor too low: for if a garden be to high, it will be exposed to the attacks of the winds, which are very detrimental to trees; and, if it be too low, the dampness, the vermin, and venomous creatures which breed in ponds and marshy places, contribute much to the unwholesomeness of the spot. It is true, as Dr. Darwin has observed, that low situations are favourable in some respects, on account of their superior warmth, and of their being more sheltered from the cold north-east winds, which, in this climate, are accompanied with frost; and from the boisterous south-west winds, that are very violent, and during summer, frequently injure the more delicate plants, by dashing their branches against each other. But in low situations, Dr. Darwin adds, the fogs in the vernal evenings moisten the young shoots and early flowers of trees, and thus expose them to the injuries of the frosty nights which succeed them, and which they generally escape when placed in more elevated ground. The best site, therefore, is on a gentle declivity, especially if it abound with springs, and the land surrounding the house be level: for the air will then be temperate, and the water descending from the hill, whether from springs or rain, will not only contribute to fertilise the soil, but also supply fountains, cascades, &c. it will be farther useful for irrigating the adjacent valley, which, if the water be not

suffered to stagnate, it will thus be rendered fruitful and salubrious.

2. A good *soil* is an object of great importance This may be ascertained, by observing whether there be any heath spontaneously growing on it, or other weeds that indicate a poor soil. But, if the land be covered with rich grass, fit for pasture, it will be advisable to investigate the depth of the vegetable earth, by digging holes in various parts, 6 feet in width and 4 in breadth: thus, if 2½ or 3 feet in depth of good mould, appear on the surface, the soil may be considered as excellent. Good land must neither be too stony, nor too hard for the spade; nor too dry, damp, sandy, or too light; lastly, neither too strong, nor clayey, as such soils are ill calculated for gardens.

3. The next requisite is *water*; the want of which is one of the greatest inconveniences in gardening: nor should it be taken from cold springs; as river water, or that from stagnant pools, is more proper, especially after it has been exposed to the rays of the sun during the day.

4. The *prospect*, though by no means an essential point, constitutes one of the greatest charms of a garden, which, if it happen to occupy a low and confined situation, is not only disagreeable, but also detrimental to the health of those who spend part of their time in such places.

In laying out a garden, its size ought never to exceed the ability or wants of the proprietor. The beauties of Nature should likewise be diligently studied; as gardens will continue to please in proportion as they approach to her design. Hence the several parts ought to be sufficiently diversified; and the general disposition of them accommodated to the inequalities, as well as the different situations, of the soil. Nor should the number and species of trees and shrubs be disproportioned to each part; nor any objects that may conduce to ornament, be excluded from the view of the garden. Lastly, in designing these delightful spots, the constant aim should be to unite all that is natural, grand, and noble.

GAR-FISH, or **SEA PIKE**, (*Esox belone*,) is a fish of the pike tribe, of green colour on the upper part, serpentine shape, with long and narrow jaws, the lower one considerably shorter than the upper. The bones are of green colour when they have been exposed to strong heat.

These fish generally are about a foot and a half in length, and weigh from one to three pounds. The late Sir WILLIAM HAMILTON, however, mentioned one caught near Naples which weighed fourteen pounds, and was sent to the king as a great curiosity.

They are found in the ocean in nearly all parts of Europe.

The gar-fish begin to approach the coasts of Great Britain in considerable shoals about the month of March, shortly after which they deposit their eggs in smooth and shallow water. Their flavour is not much unlike that of mackrel, though many persons have a great antipathy to them in consequence of the green colour of the bones.

GARGET, a disease incident particularly to black cattle: it is attended with a swelling of the throat, tongue, and the contiguous parts; and supposed to arise partly from over-heated blood, partly in consequence of eating poisonous herbs. To prevent an attack of this disorder, it has been recommended to bleed the animals in the spring. But if it has already taken place, the mouth ought to be examined, and washed with vinegar. Others advise an incision to be made with a knife, below the tongue, in order to let out the blood and water; afterwards to wash the wound with a solution of salt and alum, in vinegar. This, however, appears to us a hazardous practice, of which we have had no experience.

GARGIL, a distemper in geese, which, by stopping the head, frequently proves fatal. To effect a cure, nothing more is requisite than to take three or four cloves of garlic, pound them in a mortar with sweet butter; then form them into little balls, and give them to the animal fasting; but no food should be allowed them till two or three hours after taking this remedy.

GARGLE, or **GARGARISM**, is a liquid form of medicines used in disorders of the mouth, gums, &c.

Gargles are peculiarly useful in sore throats and fevers: they are preferable to many other remedies that are given on the spur of the occasion, as they may be easily and expeditiously prepared. Thus a gargle for softening and cleansing the mouth and gums may be procured, by simply mixing a small quantity of barley-water and honey, acidulated with a little vinegar.

An *attenuating gargle*, consisting of 6 ounces of water, ½ an ounce of honey, and a drachm and a half of nitre, will be of considerable service in inflammatory fevers and quinsies, and also for cleansing the tongue and mouth. A decoction of sage, sweetened with honey and sharpened with vinegar, is well calculated to answer a similar purpose. With the same intention, the late Sir John Pringle recommended a decoction of figs in milk and water, with the addition of a little sal-ammoniac, as an excellent gargle, especially for strangulations in the fauces.

The *common gargle* is prepared, by mixing 6 ounces of rose water, with ½ an ounce of syrup of Clove July-flowers, and acidulating this compound with spirit of vitriol: it is employed for cleansing the mouth and gums, and operates as a gentle repellent; though we believe a mixture of water and vinegar is not inferior to that elegant composition.

GARGUT, a distemper affecting all kinds of mamillary animals, especially cows when full of milk. It is occasioned by this fluid being coagulated in their bags or udders, so that it becomes corrupted and breaks out, discharging a noisome and ulcerating matter. The chief cause of the injury is owing to the neglect of milking, or *sucking down* in proper time; but it may also arise from too high feeding. Cows and sheep, when thus affected, may be cured; because these animals are tractable, and will suffer the diseased parts to be anointed with emollient applications; remaining quiet, while their teats are gently drawn down. Instances have occurred of cows, which were, even after they had lost half their bags, recovered by the simple methods abovementioned, especially by gently squeezing out the corrupted milk from the two sound teats. But sows can seldom be cured.

GARLIC, or *Allium*, L. a genus of plants comprising 54 species, eight of which we shall describe:

1. Garlic (*Allium sativum*), is a plant with bulbous root, of irregular form, composed of many smaller bulbs, called cloves, which are all included within a white skin.

The stem leaves are flat and narrow; the upper part of the stem bears small bulbs, and the stamens are three pointed.

In warm climates, where *Garlic* is produced with considerably less acrimony than Great Britain, it is much used, both as a seasoning and as food. The lower classes of French, Spaniards, and Portuguese, consume great quantities of it. The Jews also eat of it to excess. With us it is in considerable estimation for culinary and other domestic purposes. It has a very acrid taste, and an highly offensive smell, which pervade the whole plant; and it differs from onion only by being more powerful in its effects. When bruised and applied to the skin, it causes inflammation, and raises blisters.

The medical properties of garlic are various. In dropsical complaints, asthmas, and agues, it is said to have been successfully used. Some instances have occurred, in deafness, of the beneficial effects of wrapping a clove of garlic in muslin and putting it into the ear. As a medicine internally taken, it is usually administered as a bolus, or made into pills. Its smell is considered an infallible remedy against vapours, and as useful in nearly all the nervous disorders to which females are subject. An oil is sometimes prepared from garlic which is so heavy as to sink in water; but the virtues of this pungent vegetable are more perfectly and more readily extracted by spirit of wine than in any other way. A syrup also is made from it.

The juice of garlic is said to be the best and strongest cement that can be adopted for broken glass and china, leaving little or no mark, if used with care. Snails, worms, and the grubs or larvæ of insects, as well as moles and other vermin, may all be driven away by placing preparations of garlic in or near their haunts.

This plant grows wild in the Island of Sicily.

2. Leeks (*Allium porrum*), belong to the onion or garlic tribe, and are known by their leaves growing out on each side, somewhat in the shape of a fan.

In some countries leeks are much esteemed for culinary uses in soups, broth, and for boiling as greens with meat. They are considered the badge of the Welch nation, and representations of them are frequently worn by persons of that country on the day of their patron saint, St. David. The origin of this custom was an occurrence, during the Welch wars, in which a party of Welchmen, wanting a mark of distinction, and shortly afterwards passing through a field or garden of leeks, seized and stuck them in their caps, and under this signal were victorious.

Leeks are natives of Switzerland.

3. Shalot (*Allium ascalonicum*), is a kind of garlic, the bulbs or roots of which are oblong, irregular, and seldom of large size.

The stem is naked and round: the

leaves are somewhat awl-shaped, the head of the flowers is globular; and the stamens are three pointed.

The uses of shalot, or echalote, as it is denominated by the French, are almost wholly confined to cookery. It has a strong, but rather pleasant smell, on which account it is generally preferred to onions. It is employed for the seasoning of soups, gravy, hashes, pickles, and for numerous other purposes.

This plant grows wild in several parts of the continent of Europe.

4. Canadian, or Tree Onion (*Allium Canadense*), is remarkable for producing a bulb or onion at the top of the stalk.

The stem of this plant is naked and round; and the leaves are flat and narrow.

These onions are well deserving of attention, both as objects of curiosity, from producing an onion upon the stalk, and also for their use. When pickled they are generally thought superior in flavour to the common onion.

They were originally imported from Canada; are perennial, and are propagated by planting the bulbs in the spring or autumn. Either the bulbs of the root or those on the stalk will grow.

5. Chives (*Allium schœnoprasum*), are the smallest of all the garlic tribe, seldom rising more than a few inches above the ground, and the bulbs not being larger than peas.

The stem is naked, as long as the leaves; and the leaves are round, and somewhat awl-shaped.

Chives are natives of Italy, Switzerland, and several other parts of Europe; and are so hardy, and at the same time so useful, that they merit a place in every garden: yet in the northern counties of England and in Scotland they are very rarely to be seen. The leaves, which are small, and the principal parts that are used, appear early in the spring. They are employed in salads, and for numerous culinary purposes; and often at a season when other plants of the same tribe cannot be procured.

6. Common Onion (*Allium cepa*), is known by its round and hollow leaves, and its swelling pipy stalk, which is considerably thicker in the middle than either at top or bottom.

The name of onion is derived from the Latin word *unio*, which properly signifies a bulb that does not throw out offsets. Onions are propagated by seed which are sown in spring; and the bulbs or roots arrive at perfection in the autumn. The whole plant when young is eaten as salad. Onions generally cease to grow towards the middle of August, the stalks and leaves at that time shrinking and turning brown. Shortly after this they must be drawn out of the earth; the tops and blades must be cut off; and the roots dried, either in a warm place, or by exposure to the sun.

Spanish onions are of large size, and flattened shape; and *Portugal onions* are large, handsome, bulbs, of roundish form.

By the common people onions are frequently eaten raw with their food. This has particularly been the case, and from time immemorial, with the inhabitants of Egypt. By stimulating the stomach they are supposed to favour digestion; and some persons have imagined that they possess a large portion of alimentary matter: while others say that they afford little or no nourishment, and that, when eaten freely, they produce flatulencies, occasion thirst, head-achs, and turbulent dreams. They have so much acrimony as generally to affect the breath for many hours; but when boiled or roasted this is in great measure dissipated, and they then exhibit some sweetness, with a considerable portion of mucilaginous matter. Onions are of great use in several culinary preparations, but particularly in soup and pickles. They are employed in medicine chiefly as poultices for swellings; and have been recommended, by some persons, to be rubbed on bald parts of the head, to promote the growth of the hair.

7. Streaked Field-Garlic, or Wild Garlic (*Oleraceum*), which is perennial; grows in pastures, meadows, and among corn; and produces whitish-green blossoms in the month of July. It is eaten by cows, goats, sheep, and hogs: the tender leaves of this species are usually boiled in soups, or fried with other herbs, and form an wholesome article of food.

8. Broad-leaved Garlic, or Ramsons (*Ursinum*), which is also perennial: grows in woods, hedges, and meadows; and produces large white flowers, that blow in the months of May and June. This species is eaten by cows, but it communicates its flavour to the milk and butter, to such a degree as to render those articles offensive during the spring. It affords an excellent remedy for dispelling rats and moles; nor will this plant suffer any vegetable set near it to thrive. An infusion of it in bran-

dy is esteemed, according to Mr. PENNANT, a good medicine for the gravel. The inhabitants of Kamtschatka find it of great service in removing the scurcy, even in the most advanced stages.

Method for preventing the taste of Wild Garlic in Milk and Butter.

The following plan is recommended by a writer in the *Philadelphia Magazine* for 1798, for removing the garlicky taste from milk, and producing sweet, good butter, in place of that which is so generally considered as highly disagreeable.

"When the milk is new from the cow, pour one quart of boiling water into every gallon of milk; stir it through, and put the whole into broad shallow dishes, so that it will not be above two inches deep. Let these dishes be placed on an open shelf, that the vapour may pass freely and entirely away. When the milk has stood in this manner twelve hours, it may be put into the churn altogether, or only the cream, as may be most agreeable to the taste or practice of the operator. Milk from cows that have pastured on garlic, when managed in this way, will be quite sweet, as is said.

The plan here proposed is founded on analogous experience.

The feeding of cows on turnips communicates a disagreeable taste to the milk and butter; but in many parts of Britain they make excellent butter from turnip fed cows, by a plan similar to the foregoing.

The bad taste of the turnip consists in some volatile substance, which is evaporated by the hot water. Garlic is much of the same nature, but probably more volatile. Biscuit baked from garlicky flour, has no taste of garlic; but soft bread or pudding of the same flour, retains it strongly, having both experienced but an imperfect evaporation."

WILD GARLIC is unquestionably the most noxious plant with which farmers are troubled. When once it has obtained entrance in a field it is exceedingly difficult to destroy, for being a bulbous root, it is very tenacious of life, and will spring up vigorously after having been smothered for two years by a plentiful crop of clover. Nothing short of a system of farming able to destroy it while in a vegetating state, will banish it from a field. [Such a system must be founded on good manuring and fallow-crops (not fallows) where the crop requires careful horse-hoeing.—T. C.]

[GARNET, a kind of precious stone, when transparent, of a reddish-brown tint. Common opaque garnets are found plentifully in granite, in gneiss, and in mica shist: they abound in the mica shist of Schuylkill and Germantown near Philadelphia.—T. C.]

GARTER, a ligature employed for fastening or tying up stockings.

Though the use of garters be sanctioned by custom and fashion, it is by no means to be recommended, either above or below the knee; for the parts compressed acquire an unnatural hardness; and every exertion, either in walking or riding, is attended with increased fatigue. Dropsies of the legs and thighs also frequently arise from this unsuspected cause; hence, likewise, many persons stumble, fall, and dislocate, or otherwise materially injure the knee-pan. Such are the inconveniences attendant on the use of garters; they might, however, be easily prevented, by simply fastening the stockings to the wasteband, by means of tape. Trifling as this alteration may probably appear, it is of real importance to all, especially to those who are troubled with swelled or ulcerated legs, as well as to invalids and valetudinarians in general; for we are fully persuaded, that by the adoption of the expedient before suggested, many unfortunate accidents may be easily obviated.

GAS, a general term employed in chemistry to express all those ærial fluids, whether produced by chemical experiments, or evolved in natural processes, which are not condensible by the cold of our atmosphere, and which differ from the air of the atmosphere. The term gas does not include those aërial substances which arise from water, ether, &c. on the application of heat, because they are readily condensed into their respective fluids again, by a certain reduction of temperature, whereas the gases retain their elasticity in every variation of the temperature and pressure of the atmosphere. See CARBONIC ACID, HYDROGEN, OXYGEN, &c.

[GAS *from coal.* This gas is a mixture of carbonic acid, hydrogen, and carburetted hydrogen. It can be procured from tar, from rosin, from oil, from wood, saw-dust and other inflammable substances.

The directions and calculations appertaining to the use of it are so extensive, and involve the consideration of so much complicated machinery, that we must refer to ACCUM's treatise on the subject, last edition. It will answer in point of economy in large but not in small buildings. The gas is not pleasant, and it acts during combustion, on metallic substances.

To produce gas lights on a small scale. Take an ordinary tobacco-pipe, and nearly fill the bowl of the pipe with small coals, and stop the mouth of the bowl with any suitable luting, as pipe-clay or the mixture of sand and common clay, and place the bowl in a fire between the bars of a grate, so that the pipe may stand nearly perpendicular. In a few minutes, if the luting is good, the gas will begin to escape from the orifice of the pipe, when, if a piece of lighted paper or a candle be applied, it will take fire and burn for several minutes, with an intense light. When the light goes out, a residuum of useful products will be found in the bowl.—T. C.]

GASTRIC JUICE, a fluid of great importance in the process of digestion: it does not act indiscriminately on all substances, nor is it the same in all animals, nor does it continue always of the same nature, even in the same animal: it acts with a chemical energy in dissolving food, changes completely all its sensible properties, and gives it new and very different ones. This fluid does not act as a ferment, and it is a powerful antisceptic.

GAULTHERIA, a genus of plants, one species of which only is known to us as a native of the United States. It is called *Canadian Gaultheria*, or *Mountain Tea*, *Grouse-berry*, *Deer-berry*, *Ground-ivy*. It is a common and very small shrubby plant, with slender stems, having at their tops four or five oval ever-green leaves, which have been used as a substitute for Bohea tea; whence the name of Mountain tea. This tea has been used with success in alleviating the asthma.

GAUZE, or GAWSE (from the French *gaze*), in commerce, a very thin, slight, transparent kind of stuff, woven sometimes of silk, and sometimes only of thread. The gauze-loom is like a common one, but with some appendages. There are figured gauzes, and some with flowers of gold and silver, which last are chiefly brought from China.

GAZETTE, a newspaper, or printed account of the transactions of all the countries in the known world, in a loose sheet or half sheet. In Britain, the name is confined to the paper of news published by authority. The word is French, from *gazetta*, a Venetian coin, of about a farthing in value, which was the usual price of the first newspaper printed in that state. The first gazette published in England, was issued Nov. 7, 1665, at Oxford, where the court then was; and on the king's return to the metropolis, the series of *London Gazettes* commenced.

[The first newspaper published in America, was issued in 1704, called the *Boston News-Letter*.]

GELATIN, one of the constituent parts of animal substances. Glue is gelatin in a state of impurity. When pure it has neither taste nor smell. It forms a copious white precipitate with tan, which is brittle and insoluble in water, and is not changed by exposure to the air. It is a principal part both of the solid and fluid parts of animals.

GEM, a general name applied to all precious stones, which are divided into two classes; 1. The *pellucid*, or such as are clear, elegant and beautiful fossils, extremely hard, and of uncommon lustre; 2. The *semi-pellucid* gems, which are found in small detached pieces, and are composed of crystalline matter debased by earth; they are, nevertheless, of great beauty and brightness, and somewhat transparent.

The value of gems depends principally on their refractive powers, their hardness, and colour. With respect to the two former, the diamond is allowed to be the firmest, and can only be polished, or cut, by its own powder; next to it, the ruby, sapphire, jacinth, emerald, amethyst, garnet, onyx, jasper, agate, porphyry, and marble, are classed in the order we have enumerated. The same classification prevails in point of colour; the diamond is universally esteemed on account of its brilliancy; the ruby for its purple; the sapphire for its blue; the emerald for its green; the jacinth for its orange; the amethyst for its carnation; the onyx for its tawney; the jasper, agate, &c. for their vermillion, green, and variegated colours; and the garnet for its transparent red.

[The art of imitating gems is founded on the colours given by metallic oxides to clear glass: *red* is produced from gold; so is purple: *violet* or amethyst from manganese: *yellow* from silver, antimony, lead: *green* from copper, and chrome: *blue* from cobalt: *black* from very fine charcoal or lamp-black: *opalescence* from tin or arsenic, or magnesia. The best book to enable us to judge of precious stones, is one published by the Abbè HAUY in 1818, *Art de Connoitre les Pierres Precieuses*.—T. C.]

Gems, or precious stones, as they are frequently called, are for the most part transparent, and have a vitreous or glassy appearance. Their different colours are occasioned by metallic oxides of various kinds, with which they are impregnated. Some writers have classed them by their colours, but this is a very uncertain mode, since different gems have not unfrequently the same colour, and, in many cases, the same gems are of different colours. The usual distinction of gems into oriental and occidental is also liable to error, since the best gems, from whatever part of the world they are brought, are always called oriental. The most estimable of all the species are the diamond, ruby, emerald, and sapphire: and stones of a grain in weight, and equal in quality, are valued in the following proportions, at 8*l.* per carat for diamonds, 4*l.* for rubies, and 3*l.* for each of the others. The amethyst, topaz, and aqua-marine are considered of nearly equal value with each other: and the garnet is the cheapest of precious stones.

The ancients engraved upon several kinds of gems, but they appear to have been ignorant of the art of cutting the diamond, the ruby, and the sapphire, which were too hard for them to operate upon. The emerald and the noble opal were too highly esteemed as precious stones to have often found their way into the hands of engravers. It has been asserted that the ancients did not use the topaz for engraving, but there is extant a beautiful entaglio, representing an Indian Bacchus, which is said to be a topaz. The garnet was often engraved upon; and there are many master-pieces of the art in chalcedony and cornelian. Onyx and sardonyx were employed for that species of engraving in relief called cameos; and, in many instances, it is pleasing to observe with what dexterity the ancient artists availed themselves of the different colours in the alternate zones to express the different parts and shades of their figures.

Most of the gems may be imitated by artificial preparations of glass, coloured by different metallic substances; and it is not easy, by mere inspection, to distinguish the better kinds of factitious stones from real gems. They are, however, discoverable by a deficiency of lustre, and being so soft as, even in the most perfect kinds, to yield to the point of a steel instrument.

The cutting and polishing of gems is the work of the lapidary, and is in general thus performed: The form most proper to be given to any particular gem being determined on, it is cemented to the end of a stick, and the different facets are formed by a mill contrived for the purpose. This mill is a plate of copper, or an alloy of lead and tin, to which an horizontal motion is given by very simple machinery, and the surface of which is charged either with diamond powder and oil, or with fine emery and water. A thick peg of wood, called a gauge, pierced with small holes in all directions, is set upright on the lapidary's bench close to the mill, and the process of forming the facets thus takes place. The stone is placed on the surface of the mill, the opposite end of the stick to which it is cemented being inserted in one of the holes of the gauge. In this position it is kept steady by the workman with the right hand, whilst with the other he puts the mill in motion. The skill of the lapidary depends on regulating the velocity of the mill, and pressing with more or less force on the stick, with an almost imperceptible tendency to one or other direction in different stages of the work, examining each facet at very short intervals, in order to give as great precision as possible to its size and form. This part of the business being completed, the cutting mill is taken out, and replaced by one of brass, on which the polishing is performed by means of fine emery, tripoli, and rotten-stone, exactly in the same manner as is practised in the first stage of the process for setting the facets.

GENERATION, in physiology, implies the propagation of the species, whether in plants, insects, fishes, or other animals.

Generation, is also used, in Scripture, for *genealogy*, or the series of children issued from a common parent. More frequently, however, is the word generation employed at present to signify an *age*, or the average period of human life. Hence we say, "to the third and fourth generation;" in which sense historians generally compute the space of about 33 years to each generation. Thus Herodotus divides a century, or 100 years, into three generations; a calculation that appears to be tolerably correct, from the latest results of political arithmetic.

GENET. *Viverra genetta*, is a quadruped belonging to the ichneumon tribe, and nearly allied to the civet, but is distinguished by its tail having seven or eight black rings, and the body being of tawny red colour, spotted with black.

It is an inhabitant of some parts of Asia, and is also found in France and Spain. Its length is about seventeen inches.

Like the civet this animal produces, and in similar manner, an agreeable *perfume*. It is however by no means so powerful as that, and its scent much sooner evaporates. The *skin* of the genet is capable of being made into a light and handsome fur. This was formerly a fashionable substance for muffs, particularly on the continent; and as the animals are by no means numerous, was sold at high prices. After a while, however, the art of counterfeiting it by staining the skins of grey rabbits with black spots having been discovered, its value gradually abated, and at length it has ceased to be in request.

GENEVA, or GIN (corrupted from *genievre*, juniper) in commerce, an ordinary malt spirit, distilled a second time, with the addition of juniper berries. It is said that oil of turpentine supplies the place of juniper, among modern distillers, mixed up with flour, and put into the still when the spirit is rectified.

GENTIAN, the COMMON, YELLOW, or RED; *Gentiana lutea, v. rubra*, is a native of the Alps, whence it was introduced into this country. It is, however, seldom cultivated in our gardens; the root, which is employed in medicine, being imported from the mountainous parts of Switzerland and Germany.

Gentian is one of the principal bitters of European growth, and has been found of considerable service in fevers, and those complaints which arise from weakness of the stomach, and acidity in the first passages. Some years since a poisonous root was brought to London among parcels of gentian, the use of which occasioned violent disorders, and, in two cases, death. This spurious root is conjectured to have been the *Aconitum anthora*, a species of the wolf's-bane, which may be easily distinguished from the gentian, by its smell, whitish colour, and want of bitterness; whereas, the true gentian is externally brown, and of a yellowish, or bright-red colour within; has no scent, and, at first, a sweetish, but immediately after, a very bitter and pungent taste. The dose of this drug, in powder, is from 10 to 40 grains; though it is more frequently taken as the chief ingredient in bitter wines, tinctures, and infusions.

GENUS, in natural history, a subdivision of any class or order of things, whether of the animal, vegetable, or mineral kingdoms. All the species of a genus agree in certain characteristics.

GEOGRAPHY, the description of the surface of the earth, its natural divisions, and local characteristics. The fundamental principles of geography are the spherical figure of the earth, its rotation on its axis, its revolution round the sun, and the position of the axis or line round which it revolves, with regard to the celestial luminary; whence it follows that astronomy is the key of all geographical knowledge. See EARTH.

In general terms, the earth is termed a perfect sphere, in which case, the diameter from north to south would be precisely equal to the diameter from east to west; but it having been found that the latter exceeds the former by thirty-six miles, the shape of the earth is more truly denominated an oblate spheroid; by which is to be understood a globe, the upper and lower parts of which are flattened.

When any portions of the heavens are called the right or left, the expression is to be understood according to the profession of the person by whom it is used; because, according to that, his face is supposed to be turned toward a certain quarter. A geographer is conceived to stand with his face to the north, because the northern part of the earth is best known; an astronomer looks toward the south, to observe the celestial bodies as they approach the meridian; the ancient augurs, in observing the flight of birds, looked toward the east, while the poets turned to the *Fortunate Isles*: in books of geography, therefore, by the right hand we must understand the east; in those of astronomy the west; in such as relate to augury, the south; and, in the writings of the poets, the north.

Agreeably with these observations, the upper part of a map is the north; the lower, the south; the right hand the east; and the left the west. See GLOBE.

GEOLOGY, has for its object the structure and formation of this globe: it, of course, embraces the consideration of the materials of which it is composed and the circumstances peculiar to its original formation, as well as the different states under which it has existed, and the various changes which it has undergone.

[Geology is founded on the following observed facts: 1. That the strata* composing the crust of the earth, are so connected in their relations to each other above and below, that on seeing one stratum, a reasonable and probable conjecture may be made of those that lie below, and those that are likely to be found above it. 2. That there are various metallic and other mineral substances which accompany one set of strata, in preference to others. 3. That certain organic remains of vegetable and animal substances are wanting in some, and are more usually found in certain strata than in others.

The order of succession in strata that compose the crust of the earth for about three miles deep, so far as from present facts we can reasonably conjecture, has been, at various successive periods in the history of this globe, greatly disturbed and broken, raised and depressed, by earthquakes, subterranean explosions, and volcanic fires, so that the original horizontal deposition of most of the strata, has been by these causes altered into mountain-masses, hills, vallies and ravines. The seat of these subterranean explosions and fires, seems to be between the lowest known stratum (the old granite), and the nucleus of the earth. That nucleus is probably metallic: for as the mean of the nearly-coincident experiments of Sir Isaac Newton, Mr. Mitchell, Mr. Cavendish, and Dr. Maskelyne, make the specific gravity of the whole earth compared to water, equal to 5½, and as the specific gravity of the strata that compose the outward crust of the earth is not more than 2.5, the nucleus must have a specific gravity not yet observed as appertaining to any but metallic substances, unless indeed it may be given by compression. Other disturbances and alterations of the strata, are attributable to surface floods at various remote periods.

The general order of succession of the strata beginning from the lowest, is as follows, always remembering that a great number of comparatively thin and subordinate strata not here noticed intervene, and belong to the strata now enumerated. Any set of strata, that from their alternating with each other, or from their component parts and the minerals found in them, or from the circumstances of accompaniment, appear to be nearly of contemporaneous deposition, constitute what Werner and other geologists call a *formation:* this word therefore means a series or set of strata more or less in number, distinguished by the circumstances attending them, from the formations or sets of strata above or below.

Old granite; gneiss; large grained granite imbedded in the gneiss; hornblende rocks; mica slate with veins of quartz; clay-slate; steatite; chlorite; talc; serpentine, and asbest; first or deepest limestone: these rocks are the lowest and deepest series: they have in general a chrystalline structure indicating a slow and gradual deposition: they contain no organic remains of animal or vegetable matter, although some of their component parts are occasionally found to emit a fetid odour on friction, which has not yet been accounted for. This series, receives the denomination of primitive rocks: they are indubitably prior to the existence of any vegetable or any animal, none of whose remains are found in them. The next series of rocks consist of dust and fragments more or less large, mixed and aggregated, or compressed in masses and strata, apparently rather by means of mechanical adhesion than chemical deposition. Such are the rocks called porphyry; and that called by the Germans grauwacke, by the English conglomerate; grauwacke slate; transition limestone; limestone conglomerate; the transition trap rocks characterised by argillaceous and unchrystallised hornblende; and transition coal. This class of rocks is called transition; they contain some organic remains of the lower and less important species of sea animals, and some vegetables: none of these (or at least very few) belong to the countries and climates where they are now found deposited. These rocks are called by Werner, transition, because he supposes (and it is a mere supposition), that they were deposited from a turbid aqueous fluid, before the surface of the earth was as yet fitted for vegetable or animal life; so few vegetables, and no land animals, being found deposited in these rocks. The class of transition rocks, have at various periods been thrown up from below, broken, disrupted, and disarranged by the same subterranean causes that we have already mentioned. The grauwacke part of the series has been found eminently metalliferous.

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* By strata, I mean the mineral masses, extending far and wide, reposing one upon another, and distinct from each other, differing in the nature of the minerals that compose them, and forming altogether what is usually called the crust of the earth: without meaning by the word strata, that they are regularly stratified in distinct and parallel layers: for some are so, and as many are not so.

The third class of rocks, is called SECONDARY by the French and English geologists, and FLOETZ (floated or horizontal) by the Germans. They are principally mechanical deposits and aggregates, though frequently containing chrystallised veins. They occupy the lower parts of the sides of mountains, and fill up valleys; they are comparatively horizontal, and not nearly so much thrown out of place by the operation of subterranean causes, as the other two series; although they are often intersected by volcanic injections from below, and covered partially by volcanic ejections from above. They form fruitful countries, containing rivers of slow current. They consist principally of the following strata, viz.

The old red sandstone; the first horizontal limestone, called the Derbyshire limestone in England, or the metalliferous limestone; the rock salt gypsum, and coal formations; the magnesian limestone; intervening strata of sand and clay more or less pure and mixt; the volitic or roe-stone limestone, being that found in the neighbourhood of Bath and the isle of Portland in England; several strata of intervening sand and clay; the lias limestone of England; strata of sand and clay; green sand; chalk; gravel.

The fourth class is the ALLUVIAL soil, the deposited washing of higher regions.

The fifth class is the VOLCANIC soil and rocks, the produce of active volcanoes of which there are about three hundred known; or of extinct volcanoes found occasionally and partially in and upon every part of the earth. These consist of obsidian and pumice or volcanic glass; volcanic cinders; volcanic intermixtures and aggregates of various kinds: cellular lava; compact lava; basalt or whinstone; volcanic porphyry and amygdaloid; volcanic conglomerate; common volcanic ashes and tufa; ferruginous volcanic ashes and soil: such as puzzuolana and terras.

The imbedded and accompanying minerals of each of these classes are too numerous to be noticed in this sketch.

The series of extinct volcanic rocks and soil, is called by WERNER and his followers who believe them to be deposits from aqueous mixture, FLOETZ TRAP: by others who believe them to be the effect of subterranean fire, they are called VOLCANIC. The WERNERIAN set of geologists are therefore classed as *Neptunians*: the others as *Vulcanists* or *Plutonists*.

Beside these universal strata, (not universally continuous, but found in all parts of the earth as yet known) there are partial deposits in hollow basins; as the great basin of the Mississippi, the coal basin of Richmond, those of France and England; the chalk basins of Paris, London, and the isle of Wight; all of which have been examined.

For further particulars of this very interesting and important branch of knowledge we must refer to the books expressly on the subject: but the knowledge which we already possess thereon, authorises the following conclusions: viz.

1. That the surface of our globe is the sole seat of life and sensation, whether vegetable or animal.

2. That we have no knowledge but of the formations that constitute the crust of our globe.

3. That many ages must have passed, before the PRIMITIVE strata were formed or deposited; which may be deduced from their chrystalline structure.

4. That of the old and foundation granite, we know not yet whether it be a produce of igneous fusion or aqueous solution.

5. That the transition class of formations are probably constituted of the wearing down, the fragments and debris of previously existing strata, and were formed by the frequent and long action of powerful floods, with long intervals for the strata to subside.

6. That the original position of the primitive and transition strata, has been disrupted and changed chiefly by forces acting from below: sometimes from below the oldest granite; sometimes from below more recent strata and formations: all which is deducible more especially from the phenomena of basalt or whindykes.

7. That the first existence of sea animals of the lowest order, and of vegetables of the earliest date, must be reckoned from the grauwacke and transition limestone formations; few if any of the sea animals whose remains are therein imbedded, are found alive in the present day.

8. That the earth became clothed with living vegetables some time pre-

vious to the anthracite or transition coal formation found in circumscribed fields or basins accompanying grauwacke; and not fully so, till the secondary strata or most of them were deposited, to observe the main purposes of vegetable and animal life.

9. That prodigious submersions by floods or earthquakes must have taken place at various times previous to the existence of terrestrial animals, to form the coal-beds so widely scattered among the strata of our earth, out of the submerged vegetables: coal-beds being accompanied by vegetable remains in abundance, but by no animal remains except occasionally land muscle shells.

10. That no graminivorous animal could have been formed, until the surface of the earth abounded with vegetable life to supply food for the species.

11. That the remains of graminivorous animals found in various parts of the earth (about one half of which consist of extinct species) are found in alluvial soil, or the stratum of most recent formation.

12. That no carnivorous animal could have been formed, till the earth abounded in graminivorous animals to supply food to the carnivorous.

13. That man, is by far the youngest and most recent of all the known animals that inhabit the earth's surface: his remains having not been found in any known stratum: a solitary instance at Gaudaloupe being easily accounted for.

14. That the great use of geology, and toward which all its observations should tend, is, to observe and record what substances, mineral or organic, are exclusively or most commonly connected with certain strata or formations: so as to enable us to form a tolerably correct opinion of the useful substances we are likely to find in any district of country—how to get at them—and to estimate their value compared with the expense of procuring them. Also to judge from the geology of a particular district, the uses for which it is best fitted.

Mineralogy furnishes in great part the language, and elementary component parts of geological studies.

M. La Place, in his late memoir on the figure of the earth, deduces the following conclusions; from analysis, and from experiments on the pendulum in both hemispheres made to ascertain the earth's density. 1. The density of the strata from the surface to the centre of the terrestrial spheroid gradually increases. 2. That the strata are very nearly regularly disposed around the centre of gravity of the earth. 3. That the surface of this spheroid of which the sea covers a part, has nearly the figure it would assume according to the laws of equilibrium if it became fluid; Sir Isaac Newton and others have already shewn this. 4. That the depth of the sea is a small fraction of the difference between the two axes of the earth. 5. That the irregularities of the earth, and the causes that disturb its surface, have very little depth. 6. That the whole earth has probably, been fluid originally.

To the above conclusions we may add one fact determined lately by repeated experiments in many mines, viz. that the thermometer rises as you descend into the earth; and the temperature of springs is also higher, as the mines are deeper where they are found.—T. C.]

Explanation of the annexed plates of Geology.

Plate I.—Mineral Deposits.

1. Horizontal beds or strata.
   a Veins or dyes.
2. Bending strata.
3. Minerals in detached masses.
4. Disjointed strata.
   b. A fault.

Plate II.—Section of Rocks.

I. *Primitive Rocks.*

1. Granite. 2. Gneiss.
3. Mica slate. 4. Clay-slate.
   a. Lime-stone. b. Quartz.
5. Primitive lime-stone.

II. *Secondary Rocks.*

1. Transition rocks.

6. Grey-wacke.
7. Transition lime-stone.

2. Flœtz Rock.

8. Old red sand-stone.
9. Alternating strata of lime-stone and sand-stone.

III. *Alluvial Deposits.*

10. Alluvial strata of clay, gravel, &c. &c.

GEOMETRY, the art of measuring quantity of every kind; whether length, breadth, heighth; or depth.

The parts of geometry are,

1. "Longimetry," or the art of measuring lines;

2. "Planimetry," or the art of measuring surfaces;

3. "Stereometry," or the art of measuring solids;

4. "Trigonometry," or the art of measuring not only surfaces, but heights and unknown distances.

Page 234 Vol. 2.

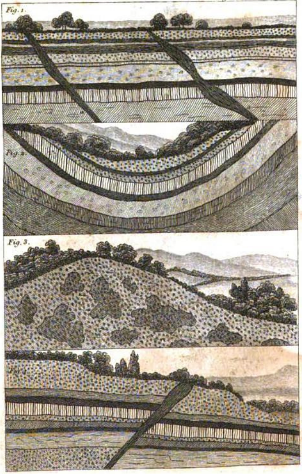
Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.

MINERAL DEPOSITS.

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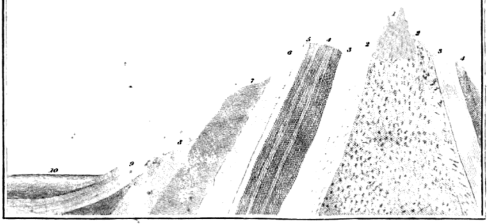
SECTION OF ROCKS.



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The instruments used in geometry are the scale and the compass: the scale to draw and measure lines; the compass to describe circles, of which the use is the measurement of angles. The scale is usually divided into feet, inches, and lines; the circle is divided into 360 parts or degrees; and when an angle of 10, 20, or any other number of degrees are mentioned, 10, 20, or the specific number of parts of a circle divided into 360 degrees is intended.

The origin of this science is always attributed to Egypt, where it is said to have been produced by the necessity of ascertaining the boundaries of landed property, which are every year effaced by the inundations of the Nile.

From the time of Euclid, who died three hundred years before the Christian æra, to that of Purback and Muller, who died in the fifteenth century, geometry was neglected. Since its revival, it has benefited by the illustrious labours of Neper, Descartes, Newton, and Leibnitz.

Geometry is of the utmost value as a branch of general knowledge, since it induces precision of thinking by admitting nothing but evident and indubitable demonstration. Geometry is distinguished into theoretical and practical. Theoretical or speculative geometry treats of the various properties and relations in magnitudes, demonstrating theorems; and practical geometry is that which applies those speculations to the uses of life in the solution of problems. The science of geometry depends wholly on definitions and axioms.

The definitions in geometry are clear, plain and universal, such as these: "A point has neither parts nor magnitude;" "A line is length without breadth or thickness." "A surface has length and breadth only." "A solid is any thing that has length, breadth and thickness." "An angle is the opening or inclination of two lines meeting in one point." "If one line standing on another makes the angles on both sides equal, those angles are right angles, and the line standing on the other is a perpendicular to that on which it stands." "A triangle is a plane figure, bounded by three lines or sides." "A circle is a plane figure, bounded by a curve line called the circumference, every part of which is equally distant from a point within called the centre."

An axiom is a manifest truth not requiring a demonstration: The following are examples of axioms, "Things equal to the same thing are equal to one another:" "The whole is greater than any of its parts, and equal to all its parts." "If equal things be taken from equal things the remainders will be equal." "Magnitudes which coincide with one another, or which exactly fill the same space, are equal to one another."

A proposition is something proposed either to be *done* or to be *demonstrated*; and is either a problem or a theorem.

GERANIUM, *maculatum*, *Crow-foot*, or *Crane's bill*, is a common plant near Philadelphia, and flowers in the spring: it is a powerful astringent, and will stop very violent bleeding. The name of crow-foot is also bestowed, in some parts of Pennsylvania, upon a species of *geum* or *bennet*—the *geum rivale* or red water avens. This furnishes an additional argument in favour of the importance of calling plants by their botanical, instead of their trivial names.

[**GESTATION.** Cows go with young from 270 to 280 days. Mares from 340 to 350 days. Sows from 110 to 120 days. Rabbits from 29 to 31 days. As to the period of gestation in females of the human species, we shall copy the following passages from the Editor's Treatise on Medical Jurisprudence, p. 224.

"In the course of our inquiries into the subject of this note, (say Mr. Ch. Butler and Mr. Hargrave, in their *Notes to Coke's First Institutes*, &c. we were curious to know the general sentiments of that eminent anatomist, Dr. Hunter, on three interesting questions. These were, what is the *usual* period for a woman's going with child, what is the *earliest* time for a child's being born alive, and what the *latest?* The answer, which he obligingly returned through a friend, we have liberty to publish; and it was expressed in the words following. 1. *The usual period is nine calendar months; but there is very commonly a difference of one, two, or three weeks.* 2. *A child may be born alive at any time from three months; but we see none born with powers of coming to manhood, or of being reared, before seven calendar months, or near that time. At six months it cannot be.* 3. *I have* known *a woman bear a living child, in a perfectly natural way, fourteen days later than nine calendar months, and be*lieve *two women to have been delivered of a child alive, in a natural way, above ten calendar months from the hour of conception.*"

The French Law on the subject, is laid down as follows, in the code NAPOLEON on paternity and filiation, chap. 1. of title 7.

Of the Filiation of Children born in Wedlock.—Translated from the Paris Stereotype Edition, 1813, *of the Code Napoleon*, Liv. 1. Titre vii. page 57.

"An infant, begotten in wedlock, has the husband for its father.

Nevertheless, the husband shall have power to disavow the infant, if he prove that, from the three hundredth to the one hundredth and eightieth day preceding the birth of the child, he was prevented, either by absence, or by the effect of some physical accident, from cohabiting with his wife.

The husband shall not be permitted to disavow the child, by alleging his natural impotence; nor shall he be allowed to disavow it, on account of adultery, unless the birth of the child be concealed from him; in which case, he shall be admitted to state all the facts proper to prove that he is not the father of the child.

An infant born before the one hundred and eightieth day from the time of marriage, cannot be disavowed by the husband, in the following cases:

1. When he had a knowledge of his wife's pregnancy before marriage.

2. When he has assisted in the act of parturition; and the birth has been acknowledged by him.

3. When the infant is declared not to be capable of living.

The legitimacy of an infant born three hundred days after the dissolution of the marriage contract, may be contested.

In those cases, in which the husband is authorised to call in question the legitimacy of a child; he must do it during the month; if he be at the place where the child is born.

During the two months after his return, if, at the time of birth, he be absent.

During the two months after discovering the fraud, if the birth of the child was concealed from him.

If the husband dies before having made his disavowal of the child, and it be still within the time allowed for this purpose, the heirs shall have two months for contesting the legitimacy of the child; counting from the time at which this child shall have taken possession of the husband's property, or from the period when the heirs shall be troubled by the child in this possession.

Every extra-judicial act containing the disavowal on the part of the husband or his heirs, shall be void if it be not followed up, during the month prescribed for this purpose, by an action at law directed against the guardian *ad hoc*, given to the child, and in the presence of its mother."

The following extract also bears on the subject.

Extract from a Report of M. Cuvier, cited in the Journal Universel des Sciences Medicales, for March 1818, p. 369 of v. 9.

"It has long been a problem in Medical Jurisprudence, which has embarrassed Judges as well as Physicians, which codes of law have determined, because it became necessary to determine it, but whereon the law of nature and the laws of men, do not generally coincide; I mean the duration of pregnancy. So many circumstances render the moment of conception uncertain, that it is hard to arrive at a conclusion to be depended on.

It has long been proposed to make experiments on animals, for it does not appear that the limits of gestation are more fixed among them, than among females of the human race. M. TESSIER has, for forty years, been occupied with this question, and has kept a register of the facts he has observed himself, or which have been communicated to him by observers who could be relied on. The latitude that takes place is considerable. Cows, whose period of gestation, is a few days beyond nine months, sometimes do not calve till 10 months and 21 days; at other times they calve at 8 months; the greatest difference amounts to 81 days. Mares commonly go 11 months and a few days; the greatest difference observed among them is 132 days; and the prolongations of the period of gestation are more frequent among them, than among cows. Sheep carry their young five months; they do not vary more than 11 days. The aberrations are on the side of premature births. This latitude diminishes in proportion as the periods of gestation in animals are shorter, but not exactly in that proportion. Bitches bear their young two months; their limits of difference do not exceed four days.—But Rabbits which go with young but one month, have a latitude of eight days. These differences in the time of gestation, do not depend, apparently, either on the age of the male or female parent, on their mode of living, on the sex of the offspring, but on some interior difference of constitution or disposition which escapes all external observation. M. Tessier is about to publish the results of his observations, in the form of tables; they relate to 577 cows, 447 mares, 912 sheep, 161 rabbits, 25 sows, 8 buffaloes, 4 bitches, and 2 asses, discarding all facts of a suspicious nature."—T. C.]

GIANT'S CAUSEWAY, a magnificent production of nature, extending two miles in length along the coast of Antrim, in Ireland, and probably running under the sea as far as the coast of Scotland, since something of the same kind is met with there, in Staffa, and known by the name of Fingal's cave. It consists of many hundred thousands of columns of a black kind of rock, harder than marble, of about twenty feet in height, and a pentagonal, or five-sided figure. Each column stands by itself, not joining another in any part whatever; and yet so compactly are the whole arranged that scarcely a knife can be introduced between them. What still farther fills the spectator with an amazement that increases by length of examination, is the circumstance that though almost every pillar is pentagonal in its form, and therefore presents an apparently general likeness, no two in twenty thousand have their angles and sides equal among themselves or to each other. [Being formed by contraction from a fused mass, not by chrystallisation.—T. C.]

The figure of these columns, as has just been said, is almost universally pentagonal: some few, however, are of three, four, six, and even eight sides; but these are so rare that they will seldom be discovered, except by the most scrutinising eye. The construction of the pillars is equally curious. They are not composed of single stones, but of joints, united to each other, not with flat surfaces, but by articulations, in the manner of bones, the one length having a ball which is received into the socket of the other. This mode of union is only discoverable by forcing one of the stones out of its place; but the joinings, together with the multitude of columns, give to this stupendous production of nature somewhat of the effect of gothic architecture, or of so many trunks of palm-trees. The stone is a volcanic basalt, of a close grit, dusky hue, and uncommon gravity. It clinks like iron, melts in a forge, and is impenetrable by tools. [It seems composed chiefly of hornblende. It is similar to all the basalts of real volcanoes. Similar basalt is the Rowley rag stone of England. The basalt of the Pasaic in New York state, and of Mount Holyoke in Massachusetts.—T. C.]

The scene is composed of various parts, thrown together with that irregularity which distinguishes and graces the works of nature, and almost constantly stamps them with a character not to be copied. The descriptions, therefore, that have been given by several travellers necessarily differ widely from each other, as being the result of observations on separate parts of a vast and broken assemblage of objects. The principal causeway runs out in one continued range of columns, and is from twenty to thirty, and for a few yards forty, feet in breadth. Its loftiest part, which has been stated at about twenty feet, is the narrowest, ten or fifteen feet being there its utmost breadth. The columns of this narrow part incline from a perpendicular, a little to the westward, and by the very unequal height of those on the two sides, form a slope on their tops, which affords a graduated ascent from the foot of the cliff to the summit of the whole. At the distance of six yards from the cliff, the structure recovers its perpendicularity, lowers its general height, spreads to a width varying between twenty and thirty feet, and extends, at all times of the tide, to the length of one hundred yards secure from the water, and supported on columns nearly of an equal height. As far as the high-water mark, this grand and extraordinary parade, though it has some inclination toward the water, may be walked on with safety; but beyond this, where it is worn with the surges of every tide, its declivity is so considerable, and its surface so uneven, that the foot is not to be trusted without the assistance of perpetual attention. At the distance of a hundred and fifty yards, it turns a little to the east, and running twenty or thirty yards in this direction, buries itself at length in the sea. At low-water, the whole visible extent of the causeway measures nearly two hundred yards: how much farther it continues is not certainly known; but from its declining appearance, it is thought to lose itself in the earth a little space beyond the spot at which it disappears.

GILDING, the art of covering a thing with gold, either in a foliated or liquid state. The beauty of gold has induced many attempts to imitate its appearance, and hence several methods of gilding have been invented. A coarse golden colour is sometimes given by painting, or by varnishing, without employing gold; but this is a false kind of gilding. In the manner alluded to such a colour is given to brass and to silver, by applying upon these metals a gold-coloured varnish, which, being transparent, shows all the brilliancy of the metals beneath. Many ornaments of brass are varnished with this *gold-lacquering*, so called to distinguish them from those which are really gilt. Silver leaves thus varnished are put upon leather, which is then called *gilt-leather*. Among the false gildings, may also be reckoned that which is performed with thin leaves of copper or brass, called *Dutch-leaf*.

In the true gilding, gold is applied to the surface of the bodies. The gold intended for this purpose is beat into thin leaves, or otherwise divided into very fine parts. When it is to be applied to a body that is of metal, the surface is previously covered with some gluey substance or size; and when the body is to be exposed to the injuries of the weather, a composition of drying oil and yellow ochre is used in place of the water-size.

In the process of gilding metals, the surface is first cleansed, and then the leaves applied, which, by means of rubbing with a polished blood-stone, and a certain degree of heat, are made to adhere in the manner desired. Gold is also sometimes fixed on metals, by previously reducing it into an amalgam or paste, with mercury. With this amalgam, the metal to be gilded is covered; and, on the application of heat sufficient to evaporate the mercury, nothing is left but the gold, which is afterward burnished with a blood-stone. Another method of gilding metal, is by the application of gold dissolved in aqua-regia.

Gold is also applied to glass, porcelain, and other vitrified substances, of which the surfaces, being very smooth, are capable of perfect contact with the gold-leaves. This gilding is so much the more excellent as the gold is more exactly applied, which done, the articles are exposed to a certain degree of heat, and afterward slightly burnished; or a more substantial gilding is fixed upon glass by the use of powder of gold mixed with a solution of gum-arabic, or some essential oil, and a small quantity of borax.

The following mode of gilding on wood was communicated by Mr. SAMUEL FOLWELL, miniature painter of Philadelphia.

"Give your wood two coats of parchment size, and when dry, give one coat of a black composed of *asphaltum* boiled in turpentine; then lay your gold leaf on, and in three hours after, you may gild."

To gild Silver, Copper, or Brass, by Amalgam.

Clean well with rotten stone the surface of the metal to be gilt. Smear over the surface slightly by means of a soft rag, with a solution of mercury in nitric acid. When dry, rub the surface with the amalgam of gold: then expose it to the heat of a common chafing dish—the mercury will fly off, and the gold will remain, which can be burnished down. Or rub the clean surface of the copper or brass with mercury till there be a coating of mercury upon it: then apply the amalgam of gold and proceed as above.

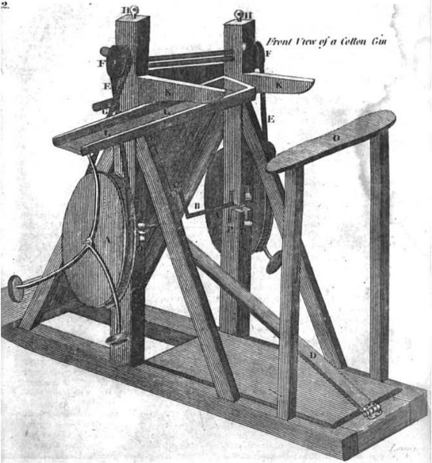
To gild another way.—Make a solution of gold by dissolving it in an aqua regia made of three fourths muriatic acid, and one fourth nitric acid. Put the solution in a Florence flask, and evaporate gently till chrystals begin to form. Take it away, set it aside to cool, and to chrystallise. Take the chrystals thus procured, and dissolve them in a small quantity of pure water. Expose the Florence flask to the heat again, till no more chrystals will fall: add these to the former. Dip your copper, brass, or silver, very well cleaned, in this solution for a few moments: then take it out, rinse it gently in pure water, dry it and burnish it. Repeat the process.

Another way.—Dip linen rags in your saturated solution of gold: dry and set them on fire: with a very soft cork moistened with water take up some of this tinder, and rub clean the surface of your silver with it. Then burnish. Repeat if needful.

Another way.—Dissolve mercury in muriatic acid, and chrystallise it: take of this muriate of mercury, and of sal ammoniac equal parts: dissolve in aqua fortis (nitric acid.) Add to this solution some filings or other small pieces of gold which will dissolve in it. With the solution of gold thus made, brush over, or moisten by means of a soft rag the surface of your clean polished silver: it will become black: rinse it in pure water: then burnish.

To gild steel the best way.—Blue the steel over a spirit lamp. When blue apply to its surface while hot, gold

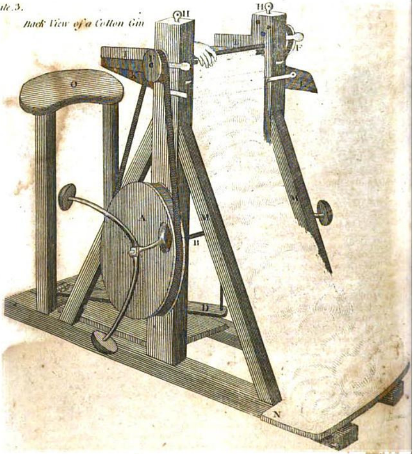
2



Front View of a Cotton Gin

Plate. 3.

Back View of a Cotton Gin



leaf; press it down: burnish it. Repeat this if necessary.

Another way.—Dissolve gold as before directed in aqua regia; (wherein, the use of nitric acid is to furnish oxygen by its decomposition to the gold, and thus enable the muriatic acid to dissolve it: for no metal can be dissolved until it be combined with oxygen.)

To a solution of gold thus made, add twice the quantity of very good, washed sulphuric ether: stop the vial: shake it repeatedly: in a few hours, the solution of gold will become clear, and all the gold will be dissolved in the ether. Pour the mixed liquors into a funnel, and let out the aqua regia, permitting the etherial solution of gold to fall into a vial, having a ground stopper, which when put by, should be greased about the stopper with hog's lard, suet or butter. With a camel's hair pencil trace your design with etherial solution of gold on your steel: heat it by means of a spirit lamp. Burnish.

To make shell-gold.—Take the paring of leaf gold, or even the leaves themselves, and reduce them into an impalpable powder, by grinding them on a marble with honey; put this into shells, where it will stick and dry: when you want to use it dilute it with gum water.

GILEAD, the Balsam, or Balm of, is a gummy substance that exudes from the bark of the *Amyris Gileadensis v. Opobalsamum* L. a native of Arabia Felix.

The balsam formerly imported into Europe, is obtained chiefly by incision; but the quantity afforded by one tree is so very small, and the collecting of it is attended with so much trouble, that the genuine balm is seldom, and perhaps never exported in a commercial way. It is of a bitterish aromatic taste, an acidulous fragrant smell, and of a yellowish or greenish colour. It is now entirely superceded by the balsams of Canada and Copaiba, which are equally efficacious.

GIN, a machine to free cotton from seeds. At present we shall describe a foot gin in use in South Carolina, and of which a drawing has been procured through the friendship of a correspondent, who observes that "this gin differs from the common foot gins, in having iron instead of wooden rollers; it also works with greater ease, and its rollers appear to have twice the velocity of those in common use. The inventor asserts he can gin sixty-five pounds of cotton per day."

Explanation of the movements of the improved cotton foot gin.

A A. Two perpendicular wheels. B the axis, on which is a crank C turned by a treadle D with the operator's foot. The wheels are each armed with a triple fly, loaded at the extremity of each arm with leaden weights of about 4 pounds each. E a leather strap, turns the collars F F of the two iron rollers, and for the purpose of turning them contrary ways, the strap on one side is reflected or twisted, and a small spindle G turning freely on its axis prevents the friction of the same. H H are two steel screws to regulate the distance which the rollers are to be apart. I is a moveable table with elevated sides on which the cotton is placed to be ginned, and resting on two arms K. This table in the back view of the machine is removed to shew a diagonal trough L. which receives the seed separated from the clean cotton. The cotton is extricated by the operator from the rollers, and falls over a platform placed on the braces M, and is received on a broad foot board N, in the front. O is a high seat on which the operator is seated. P, Q, are mortoises in the upright shaft, in which are inserted metal collars for the axis B to run in, and are regulated by wedges, as shewn in the plate.

Gin, in mechanics (a word contracted from *engine*), a machine for driving piles; or a trap.

Gin, sometimes called Geneva, or Hollands, is a malt spirit distilled a second time with the addition of juniper berries, a quarter of a pound to the gallon.

GINGER, the Common, or *Amomum Zingiber*, L. is a native of the East Indies, whence it was transplanted by the Spaniards to the West India Islands, from which Europe is chiefly supplied with its spicy root.

Ginger is a perennial shrub, which grows about a yard high. Its propagation is effected by parting the roots in the spring, planting them in pots of light rich earth, and placing them in a hot-bed of tanner's bark, where they are to remain.

The dried roots of this plant are either white, from the lime employed to prevent their destruction by vermin, or blueish, brown, or black, according to the soil in which they have been cultivated: they are of eminent use, both for culinary and medical purposes, affording one of the most wholesome and agreeable spices. Hence ginger in entire pieces is often boiled in beer, and drank by persons who are obliged to spend part of their time in cold, open open air. It is more immediately serviceable in cold flatulent colics; in laxity and debility of the stomach and intestines, especially in torbid, phlegmatic constitutions; in order to induce a brisker action of the vessels; for it is not so heating as the spices of the pepper kind, though its effects are more durable.

Ginger-bread, is a composition prepared of flour, and sugar or treacle, to which is added a certain proportion of ground ginger, whence it has received its name.

Ginger Wine. The following recipe for making a pleasant ginger wine, is recommended from experience.

To 20 gallons of water, add 80 lbs. honey, or 70 lbs. sugar, the former in preference: boil and skim as the feculent matter rises; put the mixture into an open head, and add half an ounce of ginger coarsely ground or bruised, to every gallon of the mixture; and when cooled, ferment and proceed as in elder wine, adding to every 10 gallons, when bunging close, one fourth of brandy; and if the flavour of the orange is required, proceed as in currant wine.

GINSENG, or *Panax quinquefolium*, L. is an exotic plant growing wild in North America.

The dried root of ginseng has a mucilaginous, sweetish taste, similar to that of liquorice, but accompanied with some degree of bitterness, and a slight aromatic warmth, with very little odour. The Chinese ascribe extraordinary virtues to this plant, and consider it as a sovereign remedy in almost every disease to which they are subject. No proofs, however, of its wonderful efficacy have occurred in Europe.

This well known plant, according to Dr. Mease, is the only native production of the United States, which answers to export in order to procure the luxuries of China. It is not much esteemed in China, unless clarified, except in times of a great scarcity of the plant. The process of clarifying, though hitherto kept a profound secret, consists in the careful application of heat and moisture to the fresh roots, and afterwards dipping them in hot rice water, or a solution of isinglass in water. It is observed that not more than one root in twelve will clarify. This plant grows abundantly near Philadelphia.

GLACIERS, a name given to some extensive fields of ice among the Alps.

GLACIS, in fortification. The glacis is that mass of earth which serves as a parapet to the covered way, sloping easily toward the champaign or fields.

GLAND, in anatomy, a composition of various kinds of vessels, as the artery, vein, and nerve, and appearing to the eye a white, membranous mass, the use of which, in the animal economy, is considered to be that of separating by filtration the vital fluids, and thus promoting their distribution according to their several ends. The latest authors upon this subject, which is one that has been variously explained, describe the glands as sieves, whose perforations being of different sizes, though of the same figure, only separate those particles whose diameters are smaller than their own.

GLANDERS, a disorder in horses, which manifests itself by a corrupt slimy matter running from the nose: according to the degree of malignity, or the continuance of the infection, the discharge is either white, yellow, green, or black, and sometimes tinged with blood.

The cause of the glanders is variously attributed, by some, to an infection; by others, to a diseased state of the lungs, the spleen, or the brain. When the distemper has continued till the evacuated matter is of a blackish colour (which usually happens in the last period), it is conjectured to proceed from the spine: in this case it is called the *mourning of the chine*.

GLASS, a solid, transparent, brittle substance, produced by melting together siliceous sand, and alkaline salts. It is considered as the form which bodies assume, when reduced by heat to the last state previous to evaporation. If exposed to excessive heat, glass will pass off in vapour. All solid bodies may be vitrified by fire.

The most perfect glasses are those produced by natural crystallisation, and which are known by the name of precious stones. Artificial glass is one of the most beautiful and useful substances invented by man.

The materials of which glass is made are salt and sand, or stones. The salt is procured from potass brought from the Levant, and called *polverine*, or rochetta. These ashes are those of a species of aquatic-plant, called *kali*. Common kelp, barilla, and various other vegetables also yield the salt required.

The sand or stone, which is called

tarso by the manufacturers, is the ingredient which gives body and firmness. Flints are admirably adapted to the purpose, but the expense of preparation occasions them to be sparingly used; and, where proper stones cannot be conveniently had, a white, small, shining sand is employed.

Glass is said to receive its name from the plant *glastum*, or woad, which was called *vitreum* by the Romans, and which supplies a blue colour that, in some degree, is also observable in glass. Others are of opinion, that both *glass* and *glastum* are derived from the British word *glas*, signifying *blue*.

The method of manufacturing glass was discovered, according to Pliny, by accident. Certain merchants, he relates, were driven into the mouth of the Belus, a river in Syria, by stress of weather; and being obliged to continue there, and dress their victuals near the shore, where they used kali for fuel, the ashes of the herb mixed with the sand or stones, and produced glass: a phenomenon which, being known, induced the people of Sidon to pursue the hint it afforded: and, eventually, to establish the manufacture in question among the number of human arts.

In making white and crystal glass, 200 lb of the whitish tarso, pounded small, and searsed, or passed through a fine hair sieve, is mixed with 130 lb. of the salt of polverine, or of pearl-ashes, and put into a furnace distinguished by the name of *calcar*. After exposing this composition to a moderate heat during an hour, in which space the two materials incorporate, the fire is increased for five hours more. The matter now called *frit*, being sufficiently calcined, is taken out, and kept in a dry place for three or four months. When the glass or crystal is to be made, a quantity of this crystal-frit, otherwise called *bollito*, with the addition of a due quantity of magnesia, or manganese, is set in pots in the glass or working furnace; and when the substances are fluxed, the fluor is cast into pure water, to free it from the salt called *sandiver*, that would otherwise render it obscure and cloudy. When the crystal is, by a repetition of this operation, and a proper mixture of manganese, brought to a clear and shining substance, it is fit to be blown, or formed into vessels at pleasure.

Round glass, such as phials, drinking glasses, &c. are blown. When the different materials are sufficiently liquified, the workmen dip long iron pipes into it, and blow the metal till it lengthens like a bladder. It is then rolled on a marble slab to polish it, when it is blown a second time, in order to form it into the shape of a globe. Next it is cut off at the collet, or neck, adhering to the pipe: for this purpose, the latter is rested on an iron bar close to the neck, and a drop of water poured on it, by which means it is cracked about a quarter of an inch, when it is slightly struck, or cut by a pair of shears, and immediately separated. Now the workman dips the rod or pipe into the melting metal, whence he draws out as much as will connect the glass already made, to which he fixes the rod, opposite the opening caused by the breaking or cutting of the neck. In this position, the glass is carried to the mouth of the furnace, in order to be heated, or scalded; thus it becomes so soft, that it may be pierced, opened, and moulded at pleasure, without any apprehension of its breaking. The vessel, however, is not finished till it has again been returned to the mouth of the furnace, where, after being thoroughly heated, and turned quickly round, it will open to any size, by means of heat and circular motion. Should any impurities remain, they are cut off with the shears, as the glass continues flexible till it becomes cool. And, if the vessel thus made require a foot or handle, or any other ornament, the operator forms them separately, and unites them by the help of hot metal, drawn from the pots with the iron rod: the last operation for completing the glass, is that of Annealing, which see.

Window or *Table-glass*, is worked nearly in the manner above described: the workman blows and manages the metal, so that it extends two or three feet in a cylindrical form. It is then carried to the fire, and the operation of blowing repeated till the metal is stretched to the dimensions required, the side to which the pipe is fixed diminishing gradually till it ends in a pyramidal form; but, in order to bring both ends nearly to the same diameter, while the glass continues flexible, a small portion of hot metal is added to the pipe; the whole is drawn out with a pair of iron pincers, and the same end is cut off with a little cold water as before.

The cylinder thus open at one end, is returned to the mouth of the furnace, where it is cut by the aid of cold water, after which it is gradually heated on an earthen table in order to unfold its length, while the workman with an iron tool alternately raises and depresses the two halves of the cylinder: by this process, the latter accommodates itself to the same flat form in which it is again heated, cooled on a copper table, and hardened twenty-four hours in the annealing furnace.

Window-glass is divided into various sorts, the principal of which are: 1. Crown-glass, which is the clearest and most expensive. The best window-glass is made of white sand, 60 lbs.; purified pearl-ashes, 30 lbs.; salt-petre 15 lbs.; borax, 1 lb. and of half a pound of arsenic. These materials are melted in the manner before mentioned, and if the glass should assume a dusky yellowish hue, a sufficient quantity of manganese must be added to remove that defect.

2. Newcastle glass, which is most commonly used in England: it is of an ash-colour, and frequently speckled, streaked, and otherwise blemished. Its preparation consists of 60 lbs. of white sand, 25 lbs. of unpurified pearl-ashes, 10 lbs. of common salt, 2 lbs. of arsenic, and 2 oz. of manganese.

3. Phial-glass is an intermediate kind between flint and the common bottle or green glass. The better sort is made of 120 lbs. of white sand, 50 lbs. of unpurified pearl-ashes, 10 lbs. of common salt, 5 lbs. of arsenic, and 5 oz. of manganese. The composition for green or common phial-glass consists of 120 lbs. of the cheapest white sand, 80 lbs. of wood-ashes well burnt and sifted, 20 lbs. of pearl-ashes, 15 lbs. of common salt, and 1 lb. of arsenic.

4. The common bottle or green glass, is prepared from any kind of sand fused with wood-ashes, to which may be added the clinkers of forges.

Plate-glass is the last and most valuable kind, and is thus called, from its being cast in plates of large sheets: it is almost exclusively employed for mirrors or looking-glasses, and for the windows of carriages. It is composed of 60 lbs. of white sand cleansed; 25 lbs. of purified pearl-ashes; 15 lbs. of salt-petre, and 7 lbs. of borax: and, if a yellow tinge should appear in the glass, a small quantity of manganese and arsenic are added, in equal proportions.

Plate-glass was formerly *blown*, but that method having been found very inconvenient, *casting* was invented; namely, the liquid metal is conveyed from the furnace to a large table, on which it is poured, and all excrescences, or bubbles, are immediately removed by a roller that is swiftly passed over it. It is then annealed in the manner already referred to.

The last process is that of *grinding*, which is performed by certain machinery, that is not generally known. In Britain, it is practised to the greatest perfection by Bohemians.

The *colouring of glass* with various shades, is an art known only to a few persons, and as it is not an object of domestic economy, we shall only notice a patent granted in February, 1778, to Mr. John Kent Tarrant, for his invention of painting, spangling, gilding, and silvering glass. This is effected by applying the painting to the back of the glass, so that it may appear on the front, when finished: the colours are to be prepared with oil or varnish.—Those parts which are intended to be gilt, must be previously traced on the glass, and when perfectly dry, the gold-leaf is to be applied: a similar method is to be followed for silvering. With respect to spangling, the patentee directs this process to be performed after the parts have been properly shadowed; and, as soon as the outlines are dry, the glass ought to be varnished with a solution of gum copal, and the spangles strewed on while it is wet; when they are perfectly dry, it is necessary to varnish them over two or three times.

Glass is so remarkably elastic, that if the force with which glass balls strike each other, be computed at 16, that with which they recede from their elasticity, will be nearly 15. Hence we have seen *glass feathers*, *glass wigs*, and even *glass brushes*, manufactured. If glass be exposed to the influence of dew, it becomes moist, which does not happen either with silver or any other metal. And if a goblet, or other drinking glass, be filled with water, and rubbed on the brim with a wet finger, it will impart musical notes, higher or lower, in proportion as the glass contains more or less of that fluid: it likewise possesses considerable electrical properties, and is therefore frequently employed in experiments on electricity.

Before we conclude this article, we cannot omit to take notice of the numerous accidents that frequently happen in consequence of persons inadvertently, or adventurously, swallowing fragments of broken glass. In such case, the safest remedy is to administer, as speedily as possible, large draughts of olive or other demulcent oils, by which the membranes of the stomach and intestines may be lubricated, and thus the injurious effects of the glass timely counteracted. If children, or other improvident persons, have cut themselves with glass, it is of the first importance to ascertain whether any particles of it have remained in the wound: these should, at all hazards, be immediately extracted by a skilful operator: as, without such precaution, the most dangerous consequences are to be apprehended, in parts thus injured.

For different methods of uniting *broken glass*, we refer to the articles Cement and Garlic.

Burning-glass, or burning mirror, a machine by which the sun's rays are collected into a point, and thus their force and effect considerably increased, so as to consume objects within its reach.

There are two kinds of burning glasses, namely, *convex* and *concave*. Those of the convex form are lenses, which by acting according to the laws of refraction, incline the rays of light towards the axis, and unite them in a point, or focus. The concave ones are mirrors, or reflectors, whether made of polished metal, or silvered glass; which, by the laws of reflection, throw back the rays into a point before the glass.

These instruments are undoubtedly of very ancient origin: the most celebrated were those of Archimedes and Proclus; by the former of which the fleet of Marcellus was destroyed at the distance of a bow-shot. In modern times, there have been several inventions of this kind, remarkable for their large diameter, and powerful effects; the principal of which are those of Magine, of Sepatala, Settala, and Buffon; the latter of whom made one that consisted of 400 mirrors, which reflected all their rays to one point, and with this he could melt lead and tin, at the distance of 140 feet.

Sir Isaac Newton presented a burning-glass to the *Royal Society*, which consisted of seven concave glasses, so placed that all their foci join in one physical point. This instrument vitrifies brick or tile in one second, and melts gold in half a minute.

GLAUBER'S SALT, (*sulphat of soda*,) a chemical composition, used as a purgative in the dose of 1 or 1½ oz. It is also used to procure soda by decomposing it with iron, lime, and charcoal, for the soap-boilers: also for giving the alkali of soda in the glass-pot at glass-works.

The very disagreeable taste of this salt may be in a great measure destroyed, by dissolving it in hot lemonade.

GLAZING, signifies the coating or enamelling of earthen ware with any vitreous substance, the basis of which consists of lead. It is one of those familiar arts with which the ancients were doubtless better acquainted than our modern potters. The Roman urns discovered in Yorkshire, instead of being *glazed*, are covered on both sides with a fine varnish of a red coral tint, smooth, beautiful, and incomparably more durable than all our earthen vessels; having withstood the effects of time for a long series of centuries.

On the contrary, the glazing of all our earthen ware is very apt to crack, both from moisture and heat, being composed of *lead*, one of the most pernicious metals that could be devised for such important purposes. It is well known that lead is easily volatilised by heat, and readily decomposed by any vegetable acid: hence it has been affirmed by various eminent writers, that we are under the necessity of inhaling or swallowing, perhaps every day, a minute portion of a metal which is one of the slowest, but most destructive poisons, and lays the foundation of many fatal disorders, such as palsy, dry cholic, consumption, &c. the remote cause of which has not, till lately, been suspected.

There appears to be sufficient reason to believe that our *glazed* culinary vessels may be a latent source of disease; and when fruit or acids be allowed to remain in them for some time, the liquors or substances thus preserved will necessarily acquire a very dangerous impregnation from the metal.

Instead, therefore, of describing the composition and process by which earthen vessels are usually glazed, we shall earnestly recommend various substitutes for *lead* to the attention of the public.

M. Westrumb, an eminent German chemist, was required by the government of Hanover to devise a less pernicious method of glazing earthen ware than was hitherto practised. In consequence of numerous experiments, he at length published the successful result of several compositions, in which not a particle of lead was employed, and which in his opinion will prove an useful glazing for ordinary vessels.

First: 32 parts of sand; 11, 15, or 20 parts of purified pot-ash; and from 3 to 5 parts of borax.

Second: 32 parts of glass (we suppose *flint-glass*); 16 parts of borax; and 3 parts of pure potash.

Third: 150 parts of crystallised Glauber's salt, with 8 parts of pulverised charcoal, previously roasted, till it has acquired a grey colour; 16 parts of sand; and 8 parts of borax.

Another method of *glazing without lead* has been invented by M. Hicklin, whose patent is in the *Repertory of Arts*, first series.

GLOBE, in geometry, a round or spherical body, more usually called a *sphere*. Globe, in a particular sense, an artificial sphere of metal, plaster, paper, or other matter, on the convex surface of which is drawn a map, either of the earth or of the heavens, with the several circles conceived thereon for the assistance of science. Globes, as is here suggested, are of two kinds, terrestrial and celestial, each of considerable use, the one in geography, and the other in astronomy.

A map of the world, accurately delineated on a spherical ball, will truly represent its surface; for the highest hills are so inconsiderable with respect to the bulk of the whole body, that they take off no more from its roundness than do grains of sand from the roundness of a common globe. The diameter is nearly eight thousand miles, and the perpendicular height of no known hill is much more than three.

To the eye of an observer placed in any part of the indefinite space, where there is nothing to limit his view, all remote objects appear equally distant, and seem to be fixed in a vast concave sphere, of which it is itself the centre. The moon is much nearer than the sun to the inhabitants of the earth; some of the planets are at times nearer, and at other times farther from them than the sun; others never come so near as the sun always is; the remotest planet in this system is beyond comparison nearer than any of the fixed stars: yet all these celestial objects appear equally distant. If, therefore, we imagine a large hollow sphere of glass to have fixed to its inside as many bright studs as there are visible stars in the heaven, and these studs to be of different magnitudes, and placed at the same angular distances as the stars are placed, that sphere will be a true representation of the heaven, as it appears to an eye supposed to be in its centre, and viewing it all around; and if a small globe, with a map of the earth upon it, be placed on an axis in the centre of this starry sphere, and the sphere be made to turn round on this axis, it will represent the apparent motion of the heavens round the earth.

If a great circle be so drawn upon this sphere as to divide it into two equal parts, or hemispheres, and the plane of the circle be perpendicular to the axis of the sphere, this circle will represent the *equinoxial*, which divides the heavens into two equal parts, called the northern and the southern hemispheres; and every point of that circle will be equally distant from the poles, or ends of the axis in the sphere: that pole which is in the middle of the northern hemisphere will be called the north pole of the sphere; and that which is in the middle of the southern hemisphere the south pole.

If another grand circle be drawn upon the sphere in such a manner as to cut the equinoxial at an angle of 23½° in two opposite points, it will represent the *ecliptic*, or circle of the sun's apparent annual motion; one half of which is on the north side of the equinoxial, and the other half on the south. If a large stud be made to move eastward in this ecliptic, in such a manner as to go quite round it in the time that the sphere is turned round westward 366 times upon its axis, this stud will represent the *sun*, changing his place every 365th part of the ecliptic, and going round westward the same way as the stars do; but with a motion so much slower than the stars, that they will make 366 revolutions about the axis of the sphere in the time that the sun makes only 365. During one half of these revolutions, the sun will be on the north side of the equinoxial; during the other half on the south; and, at the end of each half, in the equinoxial.

If the terrestrial globe in this machine were about one inch in diameter, and the diameter of the starry sphere to be about five or six feet, a small insect on the globe would see only a very small part of the surface of that body, but it would command a view of one half of the starry sphere, while the convexity of the globe hid the other. If the sphere were turned westward toward the globe, and the insect could judge of the appearances which arose from that motion, it would see some stars rising to its view in the eastern side of the sphere, while others were setting on the western. Now, as all the stars are fixed to the sphere, the same stars would always rise in the same points of view on the east side, and set in the same points of view on the west side: but with the sun it would be otherwise, because that luminary is not fixed to any point of the sphere, but moves slowly an oblique circle within it; and should our insect look toward the south, and call that point of the globe, in which the equinoxial seems to cut it on the *left* side, the *east* point, and that in which it cuts the globe on the *right* side, the *west* point; the little animal would see the sun rise north of the east, and set north of the west, for 182½ revolutions; after which, he would see it rise south of the east, and set south of the west, for as many more; and, in the whole 365 revolutions, the sun would rise in the east point, and set in the west, only twice. All would be the same, if the starry sphere stood still (the sun only moving in the ecliptic,) and the earthly globe were turned round the axis of the sphere eastward: for as the insect would be carried round with the globe, its motion would be imperceptible to his senses, and the sun and stars would appear to move westward. Such are the principles upon which astronomy teaches us to construct the globes, and that more comprehensive machine, the armillary sphere.

GLOW-WORM, the FEMALE of the *Fire-fly*, or *Lampyris noctiluca*, L. is remarkable for the light it emits during the night. This luminous appearance depends upon a phosphorescent liquor found at the lower extremity of the insect, which, by unfolding or contracting itself, withdraws it at pleasure.

The glow-worm flies about chiefly in autumn, and frequents the grassy plantations of juniper-trees.

GLUE, a tenacious, viscid matter, serving as a cement to unite or connect substances together.

Glues are of different kinds, according to the various uses to which they are applied; such are common glue, glove-glue and parchment-glue: but the two last are more properly called SIZE.

The common or string-glue, which is chiefly used by carpenters, joiners, &c. is prepared sometimes from the whole skins of oxen, cows, and other animals; but more generally from the parings or scraps, sinews of the legs, &c.

The parings are steeped for two or three days in water, when they are washed out, and boiled to the consistence of a jelly, which is passed, while hot, through osier baskets, in order to separate the impure particles. It is then left to subside and filtrate: when all feculent matters are settled at the bottom, the jelly is dissolved and boiled a second time; after which it is poured into flat vessels or moulds, whence it is taken out in solid masses, and cut into square pieces or cakes.—Lastly, it is suspended in a kind of coarse net fastened to a frame, or strings, where it is suffered to remain till completely dry. The best glue for common purposes used in this country is generally imported from Ireland, and is exempt even from the convoy-duty; whereas the glue obtained from foreign markets pays to the customs 9*s.* 3½*d.* per cwt.

A very superior, but expensive, glue may be prepared from the hides of the oldest cattle, especially those of bulls. Its quality is likewise much improved by long keeping; and its strength may be easily determined, by immersing a piece in water for three or four days; at the expiration of which, if it swell considerably without dissolving, and resume its former dry state, on being exposed to the air, it may be considered as excellent.

Glue is also manufactured from the skins, fins, heads, tails, and cartilages of porpoises, cuttle-fish, and other sea-monsters. For this purpose, the parts above mentioned should be boiled in water, being carefully preserved from smoke, and whatever may discolour the liquor, or render it turbid. When all the substance of the fish has been boiled down, the jelly is strained through a sieve, and suffered to cool. It is then again boiled with the same precaution, till the drops, when dried in the open air, concrete on cooling.—After having acquired a proper consistence, it is twisted in a manner similar to paste, and suspended on strings for drying in the shade. Glue, thus prepared, is more or less perfect, in proportion to the care with which it is clarified: it should be completely soluble in water.

Another very powerful glue may be prepared by a spiritous solution of isinglass, which Mr. BOYLE directs to be first steeped for twenty-four hours in common brandy; when the isinglass is opened and softened, the whole should be gently boiled together, and stirred till it forms a perfect solution, and till a drop of the cold liquor indicates a strong jelly. It is then to be strained while hot, through a clean linen cloth, into a vessel; which ought to be closely stopped. A gentle heat will be sufficient to dissolve this glue into a colourless, and nearly transparent fluid, which is said to be so adhesive, that pieces of wood glued with it, separate elsewhere sooner than in the place where they are joined. See **Isinglass**.

The following account of the mode of making glue, is extracted from a late British publication.

"Pelts obtained from furriers and hatters, the hoofs and ears of horses, oxen, calves, sheep, &c. all yield glue. These are first digested in lime-water, to cleanse them as far as it can, from the grease or dirt they may have contracted: they are then steeped in clean water, taking care to stir them well from time to time; afterwards they are laid in a heap, and the superabundant water pressed out; then they are boiled in a large brass cauldron with clean water, skimming off the dirt as it rises, and further cleansed by putting in, after the whole is dissolved, a little melted alum, or lime finely powdered, which, by their detersive properties, still further purge it: the skimming is continued for some time, when the mass is strained through baskets, and suffered to settle, that the remaining impurities, if any, may subside; it is then poured gently into the kettle again, until it becomes a clear darkish brown colour; when it is thought to be strong enough, (which is known either by the length of time a certain quantity of water and materials have boiled, or by its appearance during ebullition,) it is poured into frames or moulds of about six feet long, one foot broad, and two deep, when it hardens gradually as the heat decreases: out of these troughs or receivers it is cut when cold by a spade into square pieces or cakes, and each of these is placed within a sort of wooden box, open in three divisions to the back; in this the glue, as yet soft, is taken to a table by women, where they divide it into three pieces, with an instrument not unlike a bow, having a brass wire for its string; with this, they stand behind the box and cut by its openings, from front to back: the pieces thus cut are taken out into the open air, and dried on a coarse network, fastened in moveable sheds of about four feet square, which are placed in rows in the glue-maker's field, (every one of which contains four or five rows of net-work:) when perfectly dry and hard, it is fit for sale."

Character of good glue. That is thought the best glue which swells considerably without melting, by three or four days' immersion in cold water, and recovers its former dimensions and properties by drying. Glue that has been frosted, or that looks thick and black, may be melted over again and refined, with a sufficient quantity added of fresh to overcome any injury it may have sustained; but it is generally put into the kettle after what is in it has been purged in the second boiling. To know good from bad glue, it is necessary for the purchaser to hold it between his eye and the light, and if it appears of a strong dark brown colour, and free from cloudy or black spots, the article is good.

Mr. **Hatchett** observes, "that glue made from the skins of animals is more tenacious and of a better quality, than that which is made from feet and sinews. The more aged the animal the better the glue, but a longer continued boiling appears requisite in order to extract it, and the more viscid glues are obtained from the substances which afford them with greater difficulty, than those of a less viscid quality, which may more properly be called size. *Transactions of the Royal Society*. London, 1800, part 2."

An excellent glue may be procured from cheese. Take skimmed-milk cheese, free it from the rind, cut it in slices, and boil it in warm water, stirring it with a spoon, until it be reduced to a strong glue which does not incorporate with water. Then throw away the warm water, pour cold water over the glue, and knead it afterwards in warm water, subjecting it to the same process several times. Put the warm glue on a grinding stone, and knead it with quick lime until you have a good glue. When you wish to use this glue, you must warm it: if it be employed cold it is not so strong, though it may also be used in that manner. This glue is insoluble in water as soon as it is dry, and it becomes so in forty-eight hours. It may be used for glueing wood and for cementing marble, &c. The joining can scarcely be discovered.

Baits for catching fish may also be made of it. Fish are very fond of it, and it resists the water.

Glue of the Laplanders. The bows of the Laplanders are composed of two pieces of wood glued together; one of them of birch, which is flexible, and the other of fir of the marshes, which is stiff, in order that the bow when bent may not break, and that when unbent it may not bend. When these two pieces of wood are bent, all the points of contact endeavour to disunite themselves, and to prevent this, the Laplanders employ the following cement: they take the skins of the largest perches, and, having dried them, moisten them in cold water until they are so soft that they may be freed from the scales, which they throw away. They then put four or five of these skins in a rein-deer's bladder, or they wrap them up in the soft bark of the birch-tree, in such a manner that water cannot touch them, and place them thus covered into a pot of boiling water, with a stone above them to keep them at the bottom. When they have boiled about an hour they take them from the bladder or bark, and they are then found to be soft and viscous. In this state they employ them for glueing together the two pieces of their bows, which they strongly compress and tie up until the glue is well dried. These pieces never afterwards separate.—*Transactions of the Academy of Sciences at Stockholm.*

Common Glue.—It is a desirable fact, not generally known, that common glue, dissolved with linseed oil, will resist any weather.

To make Parchment Glue.—Take one pound of parchment, and boil it in six quarts of water, till the quantity be reduced to one, then strain off the dregs and boil it again till it be of the consistence of glue.

The same may be done with glover's cuttings of leather, which make a colourless glue, if not burnt in the evaporation of water.

To make Lip Glue, for joining Paper, Silk, or Thin Leather.—Take of isinglass and parchment glues, of each one ounce; sugar candy and gum tragacanth, each two drachms; add to them an ounce of water, and boil the whole together till the mixture, when cold, is of the consistence of glue; then form the same into small rolls, or any other figure that may be most convenient, and it will be fit for use.

This glue may be wet with the tongue and rubbed on the edges of the paper, silk, or leather, that are to be joined; and on being laid together, and suffered to dry, they will be united as firmly as any other part of the substance.

GLUTEN, a vegetable substance found in great abundance in wheat, amounting to the twelfth part of the whole substance. It is obtained by kneading the flour into paste, which is to be washed very cautiously, by kneading it under a jet of water, till the water carries off nothing more, but runs off colourless, what remains is gluten: it is ductile and elastic. It has some resemblance to animal tendon or membrane, is very tenacious, and may be used as a cement for broken porcelain vessels. It is the gluten that renders wheat so useful in the art of bread-making.

GNAT, or *Culex*, L. a genus of insects comprising several species, which are well known by the severe punctures they inflict.

Gnats deposit their eggs to the number of 200, by each female, on stagnant waters, where they are hatched into small grubs, in the course of two or three days. On the sides are four small fins, by the aid of which the insect swims about, and swiftly dives to the bottom. The larvæ retain their form a fortnight, or three weeks; when they are converted into chrysalis, in which state they continue three or four days, floating on the surface of the water, till they assume the form of gnats.

These insects have a cylindrical body, consisting of eight rings. The sting, which is perceptible to the naked eye, contains five or six spiculæ, or darts, exquisitely minute. With these, gnats make punctures in the skin, and are supposed to inject a small portion of liquor which renders the blood circulating near the wound more fluid, and thus causes troublesome itching. Others observe, that female gnats only extract the blood by suction. As, however, these stings are generally attended with a painful swelling, different remedies have been suggested for its removal; one of the most effectual consists in anointing the parts with sweet oil.

GNOMON, in dialling, the style, pin, or cock of a dial, which by its shadow shows the hour of the day. The word is Greek, and literally signifies something that makes a thing known: thus the style makes the hour known.

GOAT, or *Capra*, L. a genus of animals, comprising more than 30 species, only one of which is reared in this country, namely, the *Hircus*, or Common Goat, a native of Mount Caucasus, in Asia, whence it has been dispersed through Europe and America.

This species has arched and keeled horns, with a long beard, and is peculiarly attached to the company of man, even in its wild state. The females generally bring forth one or two, and very seldom three kids, after a gestation of about five months; they attain an age of twelve years.

Goats are sensible of caresses, and

display a remarkable attachment to their friends. They are stronger, more nimble, and less timid than sheep; possess a lively, capricious and wandering disposition; and delight in elevated and solitary places, frequently sleeping on the points of rocks and precipices. These animals are more easily supported than any others of the same size; for there are few herbs which they will not relish. Nor are they liable to so many disorders as sheep; and, though able to support the vicissitudes of heat and cold more easily than the latter, yet they are very susceptible of severe frosts, which they endure with less difficulty in the society of other animals.

Goats emit, at all times, a strong and disagreeable odour, which however is not without its use; for, if one of these animals be kept in a stable, it is affirmed that it will be an effectual preventive of the *staggers*, a disorder which is often very fatal to horses. [*Sed quære?*—T. C.]

Although the food of goats is attended with little expense, as they maintain themselves on the most barren mountains, yet their produce is of considerable value. The whitest wigs are made of their hair, for which purpose that of the Welch he-goat is in the greatest request. Their fat is in equal esteem with the hair, and candles are made of it, which, in whiteness and quality are said to be superior to those of wax; their horns afford excellent handles for knives and forks; and their skin is well calculated for gloves, especially that of the kid, which is dressed abroad, made into stockings, bed-ticks, bed-hangings, sheets, and even shirts.

The flesh of these animals, however, is hard, and almost indigestible: hence the meat of kids only should be eaten, as it is more tender, and affords good nourishment. Goat's milk is sweet, nutritive, and medicinal; it is an excellent substitute for that of asses; and, when drank warm in the morning and evening, with a tea-spoonful of hartshorn, for several weeks, it has been productive of benefit to phthisical patients, who were not too much reduced. Cheese prepared from goat's milk, is common in mountainous countries.

GOAT'S BEARD, or *Tragopogon*, L. a genus of plants comprising 16 species, two of which are indigenous.

1. The *pratense*, Yellow Goat's beard, or Go-to-bed-at-noon, (because its blossoms close about the middle of the day) grows in meadows and pastures, where it flowers in June. Dr. Withering remarks, that the young roots of this plant, in spring, may be boiled and eaten like asparagus, as they possess a similar flavour, and are nearly as nutritious.

2. The *porrifolium*, or Purple Goat's beard, is also found in meadows, and not unfrequently in upland pastures; it flowers in the month of May. The succulent roots of this vegetable, when cultivated in gardens, are called *Salsafy*. Cows, sheep, and horses, eat the whole of this plant; swine devour it with avidity, but it is not relished by goats. The tender roots afford a delicious salad, and also an excellent substitute for asparagus.

GOBELINS, or *Hotel-Royal de Gobelins*, a celebrated academy for tapestry-drawing, and manufactory of tapestry, erected in the suburb of St. Marcel, at Paris, by Lewis XIV. in the year 1666. The place was previously famous on account of the dyeing manufactory established there by Giles and John Gobelins, in the reign of Francis I. These eminent dyers discovered a method of producing a beautiful scarlet, which has ever since been known by their name; and so extensive has been their fame, that not only the colour, but the house in which their business was carried on, and the river they made use of, are called *Gobelins*.

GOLD, the most valuable of all metals, is of a bright yellow colour in its pure state, but acquires different shades, when alloyed with baser metals.

Europe is supplied with gold chiefly from Chili and Peru, in South America; though a small quantity is likewise imported from China, and the coast of Africa. This metal is also found in the sands of several large rivers which do not spring from mountains, but contain veins of gold: mines of it exist in various parts of Europe, and a very promising one has lately been discovered in the county of Wicklow, in Ireland, and at Cabarrus, North Carolina.

Gold is obtained in a pure or native state more frequently than any other metal; it is in general mixed with a stony matter, from which it is extracted by amalgamation. It is more ductile than lead, or tin, but less elastic than either iron or copper. Gold becomes hard and brittle by continued hammering, but resumes its ductility when slowly heated. Being the toughest, and at the same time the most malleable of all metals, one grain of it may be hammered into leaves that would cover a space of 1400 square inches.

This precious metal is the heaviest of all known bodies, excepting *platina*; its specific gravity being to that of distilled water as 19.2581, to 1.0000; that is, one solid inch of gold weighs about nineteen or twenty times heavier than one cubic inch of water. It melts in a low white heat, requiring, according to Mr. WEDGEWOOD's calculation, 5237 degrees of FAHRENHEIT's, or thirty two of his own thermometer; a point much higher than that required for the melting of silver or copper.

It is also the most ductile and malleable of metals. One grain of gold, it is said, may be so stretched out as to cover 98 Swedish ells, or 63.66 English yards of silver wire. Others make the calculation still more extraordinary. Sixteen ounces of gold are supposed to be sufficient to gild a silver wire equal in length to the whole circumference of the earth. With respect to its malleability, it is said that a book of twenty-five leaves of gold, contains little more than four grains of the metal.

Foliated gold, held between the eyes and the light, says Sir ISAAC NEWTON, looks of a greenish blue colour; and therefore massy gold lets into its body the blue rays to be refracted to and fro within it, till they be stopped and stifled; while it reflects the yellow outward and therefore looks yellow.

The heat of the strongest furnace does not change the metallic properties of gold; but by a long continued application of the violent power of the sun-beams, collected in the focus of a burning-glass, and instantaneously by means of the electric fluid, it may be calcined and even reduced to glass.

Gold is applied to various purposes; for instance, chains, watches, plate, the making of gold lace for liveries, &c. As the manufacture last mentioned frequently becomes tarnished, and totally loses its lustre, we shall briefly observe, that this may be easily restored, by gently rubbing the lace with a sponge dipped in warm spirit of wine.

Gold is soluble in aqua-regia.

The relative value of gold to that of silver, was anciently as *twelve* to *one*. This proportion, however, varies according to the abundance or scarcity of the former metal. In our coinage, the value of fine gold is to that of fine silver, as 15½ to 1. A similar proportion may be considered, upon an average, as the fixed standard of Europe.

There are various methods of determining the fineness of gold or the proportion of alloy which it contains. For this purpose, *touch-needles* are generally employed, by which the respective quality of gold can be ascertained with tolerable exactness. These needles are small bars made of compound metals, in different proportions, which are accurately marked on each; and, by rubbing the metal under examination, and one or more of the needles, close to each other on a *touch-stone*, the different strokes are compared, in order to judge by the colour which bears the strongest resemblance to that of the doubtful metal. The most usual stones for this test are black basaltes, or else a kind of black flint called Lydian stone or touch stone; though either flint, or potter's-ware of a black colour, may be employed with equal advantage.

Several metallic compositions, yield marks or impressions on the touchstone, very nearly resembling those of pure gold, and which can be distinguished or detected only by another more accurate test. In order to guard against such impositions, it is necessary to apply a drop of aqua-fortis to the suspected metallic strokes on the stone; if they do not disappear, in consequence of this application, it may be safely concluded that the gold is genuine; as, in the contrary case, it will be evident that it is a base or adulterated metal.

The following account of gold contains much curious matter:

Gold is a metal distinguished by its yellow colour; by its being next in weight to platina, softer than silver, but considerably more hard than tin; and being more easily melted than copper.

It is found in various states, massive, in grains, small scales, and capillary or in small branches. It cannot be dissolved in any acid except that called aqua regia, and is more than nineteen times heavier than water.

The countries of hot climates are those chiefly in which gold is discovered. It abounds in the sands of many African rivers, and is very common in several districts both of South America and India. The gold mines of Lima and Peru have had great celebrity; but since the late commotions in the Spanish colonies the working of them has been much neglected. It is from Brazil that the greatest part of the gold which is seen in commerce is brought. The principal gold mines in Europe are those of Hungary, and next to them those of Saltsburg. Spain is probably very rich in gold. Considerable mines were worked there, particularly in the province of Asturia, in former times; but after the discovery of America these were given up or lost. Gold has been found in Sweden and Norway, and also in several parts of Ireland, but particularly in the county of Wicklow. Amongst the sands of a mountain stream in that county, and amongst the sand of the valley on each side, lumps of gold are occasionally found. Pieces have been discovered which weighed twenty-two ounces, but they are generally much smaller, from two or three ounces to a few grains. It is said that lumps of gold of large size have been used as weights in some of the common shops, and that others have been placed to keep open the doors of cottages and houses in some parts of Ireland, the owners not knowing what they were. Gold is also occasionally found in Cornwall, and some other counties of England. Wherever it occurs it is commonly observed in a state of alloy with copper or silver, and in the form of grains, plates, or small chrystals. There were formerly some mines of gold worked in Scotland; and grains of this metal are now often found in brooks in that country after great floods. It has been asserted that, at the marriage of JAMES V., there were covered dishes filled with coins made of Scots gold, and that these were presented to each of the guests by way of dessert.

The mode of extracting gold and silver from their respective ores is by reducing them into a fine powder, and mixing this powder with quicksilver. The latter having the quality of uniting with itself every particle of these precious metals, but being incapable of union with the other substances, extracts them even from the largest portions of earth. The quicksilver which has absorbed the gold or silver is then separated by means of heat: it flies off in vapour, and leaves the other metal in the vessel used for the operation.

Gold has been known and in request from the very earliest ages of the world. By the assent of civilised nations it has become the representative of wealth under the form of money; and is now an universal circulating medium for the purchase of all kinds of commodities. It has been chosen to occupy this important place on account of its scarcity, its weight, and other valuable properties.

As gold is not liable to tarnish or rust, it is frequently employed for ornaments of dress. But, beyond its use in the coinage, its most important uses are for goldsmith's work, in jewelry, and for gilding. In each of these its standard or purity is different. That denominated *coinage* or *sterling gold*, consists of an alloy of about twenty-two parts of gold with two parts of copper; whilst gold of the *new standard*, of which gold plate, watch-cases, and many other articles are made, consists of only eighteen parts of gold and six parts of copper. Each of these is stamped at Goldsmith's Hall, London; the former with a lion, a leopard's head (the mark of the goldsmiths' company), a letter denoting the year, the king's head, and the manufacturer's initials; the latter is stamped with the king's head, letter for the year, a crown, the number 18 to designate its quality, and the manufacturer's initials. The coinage gold of Portugal and America is of the same standard as that of Great Britain, that of France is somewhat inferior, and Spanish gold is inferior to the French. The Dutch ducats and some of the Moorish coins are of gold unalloyed. *Trinket gold*, which is unstamped, is in general much less pure than any of the above; and the *pale gold* which is used by jewellers is an alloy of gold with silver.

The ductility and tenacity of this metal, particularly when alloyed with copper, are extremely remarkable, and are fully proved by the great extent to which a very small quantity of it may be beaten into leaves, or drawn into wire. Leaves of gold may be made so thin, that a single grain will cover more than fifty-six square inches. These leaves are only $\frac{1}{282000}$ of an inch thick; and the gold leaf which is used to cover silver wire is but the twelfth part of that thickness. An ounce of gold upon silver wire is capable of being extended more than 1,300 miles in length.

Gold is beaten into leaves upon a smooth block of marble, fitted into the middle of a wooden frame about two feet square, in such manner that the surfaces of the marble and of the frame are exactly level. On three of the sides there is a high ledge; and the front, which is open, has a flap of leather attached to it, which the man who beats the gold uses as an apron for preserving the fragments that fall off. In this process there are three kinds of animal membranes used, some of which are laid between the leaves to prevent their uniting together, and others over them to defend them from being injured by the hammer. The exterior cover is of parchment. For interlaying with the gold the smoothest and closest vellum that can be procured is first used; and when the gold becomes thinner, this is exchanged for much finer skin made of the entrails of oxen, prepared for this express purpose, and hence called *gold beater's skin.* After the leaf has been beaten to a sufficient degree of thinness, it is taken up by a cane instrument, and thrown flat upon a leathern cushion, where it is cut to a proper size with a square frame of cane, or wood edged with cane. These pieces are then fitted into books of twenty-five leaves each, the paper of which has been well smoothed, and rubbed with red bole, to prevent them from sticking. The leaves are about three inches square, and the gold of each book weighs somewhat more than four grains and a half.

It was anciently the custom to beat gold into thin plates, and to gild the walls of apartments, the surfaces of dishes, drinking utensils, and other articles, by covering them with such. But this was not only a most expensive, but it must have been a most clumsy mode of ornament. The present modes of gilding are very different. When this is to be done on wood, the surface is first smeared with an adhesive kind of oil, or with a kind of glue called size; and the gold leaf above mentioned is then spread upon it by a tuft of cotton or other soft substance. For the gilding of metals leaf-gold is applied to their surface when heated; this is afterwards rubbed with a brass wire brush under water, and is finally polished with a burnisher. For gilding in *or moulu*, as it is denominated by the French, an amalgam consisting of ten parts of mercury and one part of gold is used. This is spread upon the metal, and is afterwards exposed to the action of a fire sufficiently strong to evaporate the mercury and leave the gold behind. See Gilding.

Gold, in state of solution, is sometimes used for staining marble, ivory, ornamental feathers, and other articles, a purple red colour, which cannot be effaced. By chemical processes an oxide is obtained from this metal, which is employed for giving those beautiful shades of lilac, rose-colour, red and purple, which we observe in glass and porcelain.

The article denominated *gold wire* is generally nothing more than silver gilt, very little wire being made entirely of gold. Its uses are chiefly for embroidery and fillagree work. *Gold thread* consists of flatted silver gilt wire, laid over a thread of yellow silk, by twisting it in a machine with iron bobbins. It is of this and not of gold that the article called *gold lace* is made. The Chinese instead of flatted wire use slips of gilt paper, which they interweave in their stuffs and twist upon silk threads.

GOLDEN-ROD, the Common or Wound-wort, *Solidago Virgaurea*, L. an indigenous perennial plant, growing in woods, hedges, heaths, and copses; and flowering from July to September. This plant was formerly officinal, and is still in great repute among country people for its medicinal virtues; but we are inclined to think, it may with greater advantage be employed as a dyeing drug. Both its leaves and flowers impart a beautiful yellow colour.

GOLD-FINCH, or *Fringilla Carduelis*, L. is a native of Europe, and is sometimes also found in Asia and Africa.

This bird is peculiarly beautiful in its colour, of an elegant form, and strikes melodious notes. Its bill is white, tipped with black, and its forehead and chin of a rich scarlet tint, divided by a line passing from each corner of the bill to the eyes, which are black.

Gold-finches begin to sing early in the spring, and continue to whistle the greater part of the year, when kept in a cage. In a state of confinement, they are much attached to their keepers, and will learn a variety of little tricks, such as to draw up small vessels containing hemp or Canary-seeds, and water; to fire squibs or crackers, &c.

Gold-finches construct very neat and compact nests with moss, dried grass, and roots, which they line with wool, hair, the down of thistles, and other soft substances. The females lay five white eggs, marked with deep purple spots at the larger end: they feed their young with caterpillars and insects; but the old birds subsist on various kinds of seeds, especially those of the thistle, of which they are extremely fond.

As these birds are frequently liable to be sick, it will be requisite to allow them every day a little groundsel, and some saffron in their water. If they are lax, a small portion of chalk should be given them, either by fixing it to the side of the cage, or crumbling it on the bottom.

Red sand, or gravel, should likewise be strewed every day in their habitation; for, as they chiefly subsist on oily seeds, the gravel or sand will qualify, and absorb the oil in their stomachs. Gold-finches will breed with the Canary bird: this intermixture is most successful between the male finch and the female Canary, whose offspring is productive, and is said to resemble the male in the bill, the colours of the head and wings; and the hen in the rest of the body.

Gold-finch, (*Fringilla tristis*) called yellow bird, or Dutch yellow bird, to distinguish it from a beautiful little summer bird of passage (*motacilla æstiva*) or the common yellow bird.

It is about the size of the *F. Carduelis*, above mentioned, of a beautiful light yellow colour, except that it has a crow black spot on the forehead, larger feathers in the wings and tails, which are also of the same crow colour. It is a beautiful vivacious little bird; its notes are variable and lively, some of them seem to resemble the Canary bird, with which they will breed, producing mules of various colours.

GOLD-FISH, or *Cyprinus auratus*, L. is a native of the East Indies, whence it was introduced into England about the latter end of the 17th century.

These fish are very tender, even in their native climates; but they are now become so naturalised, that they even breed in this country. They are chiefly kept in glass vessels for ornament; but it has lately been ascertained, that they thrive and propagate in ponds or other reservoirs; where they grow much larger and come to greater perfection than in the East: hence it is proposed to rear them in preference to *carp*, on account of their possessing a finer flavour, and being much better calculated for the table than the common carp.

GOOSE, or *Anas anser*, L. a well known species of birds, very common in this country: it is divided into two varieties:

1. The *ferus*, Grey Lag, or Wild Goose, that inhabits the fens, where each female hatches eight or nine young, which are frequently caught, easily tamed, and afford excellent meat, far superior to that of the domesticated kind. Towards winter, they collect in flocks, but reside the whole year in the marshes.

2. The *mansuetus*, or Tame Goose, or the Grey Lag in a state of domestication, from which it varies in colour, being more or less inclined to a grey. It is, however, often found perfectly white, especially the males or ganders.

There is a valuable breed of this fowl in the southern states, from a mixture of the largest Grey Goose, with the wild Canadian Goose, (*Anas Canadensis*). They are much larger than any sort of tame geese; and in their cry and manners resemble the Canadian Goose.

The goose, in general, breeds only once in the course of a year; but, if well kept, it will frequently hatch twice within that period. Three of these birds are usually allotted to a gander; for, if that number were increased, the eggs would be rendered abortive: the quantity of eggs to each goose for sitting is about twelve or thirteen. While brooding, they ought to be fed with corn and water, which must be placed near them, so that they may eat at pleasure. The males should never be excluded from their company, because they are then instinctively anxious to watch over, and guard their own geese.

The nests in which these birds sit, ought to be made of straw, and so confined that the eggs cannot roll out, as the geese turn them every day. When they are nearly hatched, it will be requisite to break slightly the shell near the beak of the young goslin, as well for the purpose of admitting air, as to enable it to make its way at the proper time.

Geese are very valuable on account of the feathers they afford: for this purpose, they are unmercifully plucked in the county of Lincoln, England (where they are reared in large numbers) *five times* in the year: the first operation is performed at Lady-day, for feathers and quills, and is repeated four times between that period and Michaelmas, for feathers only. The old birds submit quietly, but the young ones frequently prove unruly and noisy. The latter may be plucked once when about thirteen or fourteen weeks old, for feathers; but no quills must be taken from them; nor should this operation be performed at too early a season, because the goslings are liable to perish in cold summers. Although the plucking of geese has by many been considered as a barbarous custom, yet experience has evinced, that these birds, when properly stripped of their feathers, thrive better, and are more healthy, than if they were permitted to drop them by moulting.

As geese form a principal delicacy at our tables, the most expeditious mode of fattening them is an object of some importance. Hence it has been recommended to keep them cooped up in a dark and narrow place, where they are to be fed with ground malt mixed with milk, or if milk be scarce, with barley-meal, mashed up with water. Another, and less expensive way, of which we can speak from experience, consists in giving them boiled oats, with either ducks'-meat, or chopped carrots, alternately, as they are exceedingly fond of variety: thus, they will become very fat in a few weeks, while their meat acquires a fine flavour.

The following article contains much additional information:

The Wild Goose, *Anas anser*, is distinguished by having a somewhat cylindrical bill, the body ash-coloured above and paler beneath, and the neck striate.

Large flocks of wild geese frequent all the fenny districts of England, and are also found in the northern parts of Europe, Asia, and America.

These birds are killed on account of their flesh, which is an excellent and nutritive food; and they are the stock from which our common or *tame geese* have been obtained.

Vast numbers of the latter are kept in the fens of Lincolnshire and other parts of England, and chiefly for the sake of their quills and feathers. Of these they are unmercifully stripped whilst alive, once every year for the former, and five times for the latter. The quills, which are the large feathers of the wings, are termed firsts, seconds, and thirds, from the order in which they grow. The two last kinds are those principally used in writing, on account of the larger size of their barrels. And as the utility and value of quills in the making of pens greatly depend on their firmness and elasticity, different expedients have been contrived to harden them. The most simple of these is to thrust the barrel into hot sand or ashes for a few moments, afterwards to press them almost flat with a penknife, and then to restore their roundness by the fingers, with the assistance of a piece of leather or woollen cloth, removing at the same time their external roughness by the friction. When however great numbers are to be prepared other methods are adopted. Aquafortis is frequently employed in the preparation of quills, by which they are stained a yellow colour.

All the best feathers that are used for making beds, bolsters, and pillows, are those of geese. Great quantities of goose and other feathers are annually imported into Great Britain from the north of Europe; but these being insufficient for the demand, the feathers of cocks and hens, and also of ducks and turkeys, all of which are much inferior to those of geese, are frequently mixed with them. The best mode of preserving feathers is to expose them in a room to the rays of the sun; and as soon as they are thoroughly dried to put them loosely into bags, in which they should be well beaten to cleanse them from dust and filth. Of late years feathers have been manufactured into hats.

The usual weight of a fine goose is fifteen or sixteen pounds, but it is scarcely credible how far this may be increased by cramming the birds with bean-meal, and other fattening diet. In some places it is customary to nail them to the floor by the webs of the feet, to prevent any possibility of action, and thus to fatten them the more readily. In Vienna, the livers of geese are esteemed a great delicacy. They are eaten stewed, and some of the German poulterers have a method of making them grow to an enormous size.

In the choosing of geese for the table, care should be taken that the feet and legs be yellow, which is an indication of the bird's being young: the legs of old geese are red. If recently killed the legs will be pliable, but if stale they will generally be found dry and stiff.

These birds are denominated *green geese* until they are three or four months old, and at this immature age are by many persons in great esteem for the table.

There are several other species of goose besides the present, which are useful to mankind on account of their quills and feathers, and likewise as supplying them with food.

GOOSEBERRY, the Rough, or Feaberry, *Ribes grossularia*, L. an indigenous shrub growing in woods and hedges, also, on old buildings and church-towers, whither it has probably been transplanted by birds. This useful bush flowers in April, and bears fruit in June or July, which, however, does not acquire its natural vinous flavour in this climate, till August or September.

Although gooseberries are generally eaten, or employed for culinary purposes, before they arrive at perfect maturity, yet being one of the most saccharine productions we possess, they might with more advantage be converted into *wine*. As each pound of the juice expressed from ripe berries requires only one ounce of soft sugar, (whereas the ripest currants require double that quantity) to induce the vinous fermentation, a very excellent and wholesome domestic wine may be made at a trifling expense. After standing several years in bottles well corked, it becomes equal in quality to muscadel, or other sweet Italian wines. If the flower-buds of this shrub be added to a cask of any other flavourless wine, **Bryant** asserts (in his 1st. volume of "*Nutritive plants*," p. 245, German edition) that they impart to it the taste of genuine muscadine.

The husks of this fruit, when the juice is expressed for making wine, are usually thrown away: it appears, however, that they may with advantage be employed in distillation, and afford an agreeable spirit resembling brandy. It has indeed been ascertained by experience, that such liquor, after having been kept a few months, was little inferior, in point of strength and flavour, to the best French Coniac.

Gooseberries do not succeed well near Philadelphia, owing probably to the great heat of our summers: for it is understood, that in Canada and Nova-Scotia, this fruit grows to a large size. A successful cultivator of gooseberries at Newcastle upon Tyne, was in the practice of covering the bushes with mats, to prevent the influence of the sun causing a rapid maturity. Probably a shady situation in the United States would answer equally well.

Dr. **Darwin** gives the following additional reason for covering fruit and plants: "When vegetable fibres have been long stimulated more than natural or usual by increase of heat, the spirit of vegetation becomes exhausted; and in consequence a slighter degree of cold will destroy them; because their fibres, after having been long excited by a greater stimulus, will cease to act on the application of one which is much less; whence after hot days, tender plants are more liable to be destroyed by the coldness of the nights. For this reason also, in more *northern climates the gardeners shade their tender vegetables, as the flowers of apricots*, in the spring frosts, from the meridian sun, as well as from the *coldness of the night*, which is generally the greatest about an hour before sunrise."—*Phytologia*, Sect. xiv. 1. 1.

At an annual gooseberry shew at Chester, England, the following were adjudged to be the principal prizes, viz. of red, Mr. **Bell's** *Alcock's King*, weighed 18 dwts. 19 grs.—of yellow, Mr. **Warburton's** *Royal Sovereign*, 14 dwts. 10 grains—of green, Mr. **Warburton's** *Langley Green*, 14 dwts. 5 grs.—and of white, Mr. **Warburton's** *Whitesmith*, 16 dwts. 1 grain." *Monthly Mag.* London, Sept. 1801.

In **Holt's** *View of the Agriculture of Lancashire*, we also find the following facts: "A single gooseberry tree, the Manchester rough red, in the garden of J. **Sykes**, yielded *twenty-one* quarts of fruit in their green state; the whole quantity weighed *twenty-eight pounds!* avoirdupois." **Forsyth** gives a list of the most celebrated gooseberries, with their respective weights, which shows to what perfection this fruit is brought in England.

Gooseberries are a delicious and wholesome fruit, and would be found very profitable, if attended to, in the United States. They not only afford a very pleasant article of diet, but also form the chief article in an excellent domestic wine.

[Gooseberry wine approaches nearer to Champagne than any other: and when made of ripe fruit is *at least* equal to Champagne.—T. C.]

This fruit may be preserved by being put up dry in a large mouthed, strong black bottle, covering the cork well with rosin.

The following directions for cultivating gooseberries are taken from **Forsyth.**

Gooseberries are raised from cuttings, or from seed, and some raise them from suckers; but this last is not a good way, as bushes raised in this manner are more liable to throw out suckers than those which are raised from cuttings or seed.

The best time for planting cuttings is about Michaelmas, always cutting them from the strongest and cleanest shoots. The length of the cuttings should be from six to eight inches, planting them to an East or North aspect, at the distance of one foot from row to row, leaving them about three inches above ground. By planting at this distance, you will be able to hoe and keep them clear of weeds. Water them frequently in dry weather during the spring.

The Methods of Planting Gooseberries.

The Market-Gardeners about London plant them in rows from eight to ten feet apart from row to row, and six feet from plant to plant in the rows. In that case, I advise pruning them in the beginning of October, and the ground between may be planted with Coleworts or Beans for a spring crop; by so doing, there will be no occasion to tread over the ground and hurt the coleworts in pruning the bushes; for, before the gooseberries begin to shoot, the coleworts will be all cleared off the ground.

After this time (or before if you find it convenient) lay a good coat of rotten dung on the ground; then dig it and plant early potatoes; but not so near to the gooseberries as to hurt them.

The roots of gooseberries should always be kept clear to admit the sun and air. In small gardens I would recommend planting them in a quarter by themselves, at the distance of six feet between the rows, and four feet from plant to plant; or you may plant them round the edges of the quarters, about three feet from the path; you will then have the ground clear for cropping, and a man, by setting one foot on the border, can gather the gooseberries without injuring the crop.

As gooseberries love a rich soil, they should be dunged every year, or at least have a good coat of dung once in two years.

Never plant them under the shade of other trees, as it will injure the flavour of the fruit.

Of Pruning Gooseberry Bushes.

It is a practice too common in pruning gooseberries, to let them branch out with great naked stems, suffering them to remain in that state for years. —When that is already the case, they should be cut down near to the ground in the winter pruning; this will make them throw out fine strong healthy shoots which will bear fruit the second year. Gooseberry-bushes, in general, bear their fruit on the second year's wood. Care should be taken in summer to keep the middle of the bush clear to admit a free air into them; leaving the finest and strongest shoots from six to ten inches distant from each other.— This will help to ripen and harden the wood. It is a practice with some to shorten the shoots in the autumn or winter pruning: This should be always near to a wood-bud; which may be known by its being single, whereas fruit-buds are in clusters. The shoots may be shortened to eight or ten inches, according to their strength.— Some leave them at full length for three or four years, thinning out those that are superfluous. Always leave a proper number to be trained up between the full length shoots, to succeed them when they are tired of bearing; then cut the old ones down to the young ones that are to succeed them. By these means you will always keep the bushes in a constant state of bearing.

You may observe, that those branches which were cut the first year, will in the second throw out short dugs, or spurs, which produce the fruit; and these should by no means be cut off, unless the branches are in a sickly state, and require to be cut close down, when the bushes are overloaded with fruit. It will then be necessary to cut out a good deal of the old wood, to assist nature to recover herself after producing so great a quantity of fruit.

It is a practice with some to clip the tops of gooseberries with a pair of garden shears, as they would clip a thorn hedge; this I by no means approve of, as the fruit will not be half the size, nor of so fine a flavour, as when the bushes are kept clear of superfluous wood.

Care should be taken in spring and summer to stock, or grub up, all the suckers from the roots of the bushes, leaving their stems clear and unencumbered.

Many of the Lancashire sorts are apt to grow horizontally, and the branches frequently trail on the ground, which renders them liable to be broken by high winds, especially when they are loaded with fruit. In that case I would recommend two or three hoops to be put round them, to which the branches may be tied, to support them, and prevent their being broken by the wind.

Those who wish to have their gooseberries very late should plant on North walls and palings, between the other trees, and they may be removed when the trees begin to meet. If laid in thin, they will be very fine and handsome fruit. I would advise to plant the finest late sorts; as by this method the table will be supplied much longer than by the common custom of planting in quarters.

Immediately after pruning, I always apply the composition to the ends of the shoots and cuttings; and I find it of great use in preventing the exhalation of the sap, and preserving the cuttings till they take root.

Gooseberries are very much infested with a small green caterpillar, which frequently devours both leaves and fruit.

You must, therefore, be very attentive, and observe their first appearance on the bushes; for, if not destroyed early, they will increase so fast, that they will soon devour all the leaves, and the fruit will then be good for nothing. They make their first appearance generally on the edges and undersides of the leaves.

Take some sifted quick-lime and lay it under the bushes; but do not at first let any of it touch the branches or leaves; then shake each bush suddenly and smartly, and the caterpillars will fall into the lime; if the bush be not shaken suddenly, the caterpillars, on being a little disturbed, will take so firm a hold as not easily to be shaken off. After this is done, sift some of the lime over the bushes; this will drive down those which may have lodged on the branches. The caterpillars ought to be swept up next day, and the bushes well washed with clear lime-water mixed with urine; this will destroy any caterpillars that may still remain, and also the aphides, if there are any on the bushes.

To the above, we will only add, that in case the gooseberry bush does not succeed on first planting, *change its position*: by doing so *three times*, a friend at last succeeded in raising a very fine bush, which amply rewarded his trouble and patience.

Dr. Anderson, who has investigated the natural history of the gooseberry caterpillar with great minuteness, observes, that these insects always commit their depredations on the under sides of the leaves, at the bottom of the bush: and begin by gnawing off the edges. While young, they herd together, but as they advance in size they separate. He therefore directs the tree to be searched repeatedly, to pinch off all leaves on which the caterpillars are found, and to kill them instantly. By this method he saved his bushes, though the caterpillars seized upon them in such numbers, that had they been neglected only for a few days, every leaf must have been destroyed.

The following mode of destroying gooseberry caterpillars is given in the London Monthly Magazine, for March, 1800.

"Make a cone by covering three or four hoops with a tarpaulin, or coarse brown paper. When the trees are affected by the caterpillar, strew hot lime under and around the trees, and cover the bush with the cone; fill a common fumigating bellows with tobacco and sulphur in equal quantities, with a bit of charcoal, or any other piece of firewood; thrust the pipe of the bellows through a small hole of the painted cloth at the bottom of the cone, when a few moments are sufficient to suffocate all the caterpillars; falling on the lime, they serve as a manure to the tree. No injury is done to the tree."

All the different gooseberries are wholesome fruit, but should not be eaten before they are perfectly ripe; nor is it proper to swallow their stones along with the juice; but the skin may, with probable advantage, be used by those who are accustomed to take large quantities at one time, in order to prevent flatulency. It is, however, founded on erroneous notions of their chemical properties, either to boil the *unripe* berries for sauces, or to convert them into domestic wines, which, though more cooling and refreshing, do not possess the delicate flavour, and rich saccharine quality, inherent only in ripe fruit.

GOOSE-FOOT, or *Chenopodium*, L. a genus of plants, comprising twenty-seven species.

[**GONG**, a kind of metallic drum used in China, consisting of 78 parts copper and 22 tin.—T. C.]

GORDIUS, the hair-worm, a genus of the Vermes Intestina, of which there are five species. The Gordius aquaticus is from four to six inches long, is found in stagnant waters, and twists itself into various contortions and knots, and it is said that it will inflict a bite that occasions the whitlow.

GOSSAMER, is the name of a fine flimsy substance, like cobweb, which is seen floating in the air in clear days in autumn, and is more observable in stubble fields, and upon furze and other low bushes. This is probably formed by the flying-spider, which, in traversing the air for food, shoots these threads from its arms, which are borne down by the dew.

GOTHIC ARCHITECTURE, a style of building which stands opposed to the Greek and modern, and which obtained in England from the middle of the twelfth to the beginning of the sixteenth century.

The origin of this species of architecture is ably pointed out by Sir James Hall, in the fourth volume of the "Edinburgh Transactions." He supposes a set of round posts driven firmly into the ground in two opposite rows, the intervals between the several posts being equal to that between the rows, and the height of each post being equal to three intervals. Long and flexible rods of willow being afterward applied to each post, let them be thrust into the ground at its base, and bound to it by two tyeings, one near the ground, and another at two thirds of its height; and let the rods be left loose from this point upward, and free to be moved in any direction. Let three rods be connected with each outside corner-post, and five with each of the others; and let their position be such as may enable them to cover the main-post, so that when seen from between the rows, the lower part of each post shall be concealed from the view, and present the appearance of a bundle of rods.

Of the loose ends of the rods, the skeleton of a thatched roof may be readily formed. A rod from one of the posts being so bent as to meet a similar one from the post immediately opposite to it, in the middle of the space between them, and the two rods being made to cross each other, and bound together at their crossing, the complete figure of a gothic arch will be obtained.

[GOULARD'S EXTRACT. Used to repel inflammations, is vinegar saturated with white lead.—T. C.]

GOURD, or *Cucurbita*, L. a genus of plants comprising nine species, of which the following are the principal:

1. The *lagenaria*, or Bottle Gourd, a native of both Indies, where it grows on the banks of rivers; it has thick, trailing, downy stalks, extending from 10 to 20 feet, and producing large white flowers, which are succeeded by long incurvated fruit of a whitish yellow colour, from 2 to 5 or 6 feet in length, and from 9 to 24 inches in circumference.

2. The *Pepo*, Pompion, or Common Gourd, which is cultivated in various parts of Germany, but the native soil of which is unknown. It produces fruit of various shapes and sizes, frequently 18 inches in diameter, and its culture in a tolerable land exposed to the rays of the sun, requires but little trouble.—The pulp of the fruit is eaten as an ingredient in puddings and pancakes.—But the most economical use of this bulky vegetable production, is that of fattening pigs, as well as carp when thrown into fish-ponds. For these purposes, extensive fields are devoted to the growth of the Common Gourd in Bohemia, Saxony, Thuringia, &c. climates which coincide with many parts of Great Britain, so that this plant certainly deserves to be more generally reared in that country. Besides, its numerous seeds afford an unusual proportion of expressed oil, amounting to one half of their own weight: when triturated with water, they yield a cooling and nutritive milk; and boiled into a jelly, they are said by BECHSTEIN to be a very efficacious remedy for curing a retention of urine.

3. The *verrucosa*, or Watered Gourd, which is reared in America as a culinary vegetable: its young fruit is eaten boiled, and frequently mixed with wheaten flour in the baking of bread, to which it imparts a yellow colour, but an agreeable taste.

4. The *Melopepo*, Erect Gourd, or Squash. It has a long erect stalk, several feet in height, which becomes bushy towards the top. It produces a knotty fruit, of a moderate size, and is used like the preceding species.

5. The *lignosa*, Ligneous-shelled Gourd, or Calabash, which has long trailing stalks, extending along the ground in every direction. Its smooth roundish fruit is provided with hard woody shells.

All these species of the Gourd have several varieties, and the fruit of each frequently changes its form. They are raised from seed, set annually in the month of April, or in the beginning of May. But, if the plants be forwarded in a hot-bed till they are a month old, they will produce fruit six weeks earlier, and mature comparatively sooner. The first species, or Bottle-Gourd, however, seldom ripens in Britain without the aid of artificial heat. Hence these plants are in our climate cultivated chiefly for curiosity, but in the East and West Indies, Bottle-Gourds are sold in the markets, and constitute, during the summer months, the principal food of the common people, who boil and season them with vinegar; and, sometimes filling the shell with rice and meat, prepare a kind of pudding. These shells are employed as flasks for holding water, and likewise converted into spoons, funnels, and even hats. Lastly, it is remarkable, that the stalks of the different species of the gourd contain a considerable proportion of nitrous particles, and might therefore become useful in the manufacture of salt-petre.

GOUT, or PODAGRA, a disease of the Proteus-kind, thus defined by Dr. CULLEN: It is hereditary, and commences without any apparent external cause, but is in most instances preceded by acid indigestion, or other affection of the stomach; its paroxysms are ushered in with fever, pain at the point, generally, of the great toe, always attacking the joints, and chiefly those of the feet or hands: it returns at intervals, often alternates with indispositions of the stomach, or other internal parts.

Forerunners of the Gout:—Indigestion often returning; thick sediment in the urine, sometimes for a whole year previously to the paroxysm, while that fluid emits the flavour of milk; vomiting, hiccough, and frequent pains of the forehead; acidity in the stomach.

Peculiarities of the disease:—Chalky excrescences appear on the joints, which shortly before death also cover the face. It occurs most frequently in the spring; is often connected with the stone or gravel; and has sometimes been confounded with acute rheumatism.

Causes:—Acid food, the use of wine, cyder, and spiritous liquors; luxury and debauch of every kind.

Prevention and Cure:—During a paroxysm of the gout, the patient ought to be treated according to the state of his *fever* (which see); and, as the crisis of the disease generally takes place in three or four weeks, either by transpiration of the pores, or the discharge of urine, those secretions should be promoted by the mildest sudorifics and diuretics. Hence diluent drinks, such as barley-water, should be liberally drank; but, where impurities in the first passages are suspected, gentle purges may be administered; and if fulness of blood prevail in the vessels, venesection will perhaps be advisable. Marino, an Italian physician, prescribed for his gouty patients half a pound of olive oil, to be swallowed several times a day, with uncommon success: but we apprehend, that few persons will be inclined, or able, to take such profuse draughts. Meanwhile, the parts affected should be carefully covered with flannel.

When the gout retreats to more dangerous, internal parts, such as the breast and stomach, it is generally attended with vomiting, which, if violent, and in an elderly person, may be restrained by warm wine and water, warm brandy toddy, or by a tea spoonful of æther in a wine glass full of water: but if the subject be young, and the pulse true and full, bleeding is a better remedy. As soon as the stomach is composed, doses of vitriolic æther and opium internally, will be of essential service to allay the spasmodic action of the viscera. At the same time, sinapisms should be applied to the soles of the feet, and the lower extremities kept warm; a treatment by which the pain, as well as the seat of the disease, easily returns to its former place.

Various expedients and plans of regimen have been devised, in order to prevent, or retard, the fits of the gout. As we cannot enter into the peculiarities of different constitutions, we shall here briefly point out that mode of living which will, in general, be found the most conducive to the purpose.—Temperance, in the strictest sense, total abstinence from acid, fermented and spiritous liquors, and a very moderate use of wine, are the principal circumstances to be attended to by the gouty; but, in their food also, they should be extremely careful, and avoid all fat, rancid provisions. Spices, pickles, and stimulating dishes, in general, are the most powerful promoters of this painful disease; while hot suppers, late hours, and long sleeping in featherbeds, are its greatest nursery. Hence, persons liable to attacks of the gout, ought attentively to observe whatever agrees or disagrees with their digestive organs; for, as long as their stomach duly performs its office, there is reason to hope for a favourable change. Moderate exercise should likewise, on no account, be neglected; because excessive fatigue and long-continued application to intense study, are equally detrimental. Absorbent powders, consisting of two scruples of calcined magnesia, with purified kali and powdered rhubarb, from three to five grains of each, have likewise been taken with considerable advantage during the intervals of gouty fits; but this medicine ought to be repeated for several weeks, or even months, at least every other morning, according to the nature of the case.

Every gouty person should read Dr. Warner's treatise on this disease, as it contains an excellent system of directions, the result of observations and of experience upon himself. The theory which he gives of the complaint is indeed absurd, as might be expected from the time in which he wrote, but the practice he advises is certainly highly proper. Dr. Mease says, he has had so much experience of the efficacy and utility of his prescriptions, that he thinks proper to insert them, in order that they may be kept in families.

1. *Anodyne Tincture.*

"Take of opium six drachms; Castile soap, 1 ounce; nutmeg powdered, 1 drachm; camphor, 3 drachms; saffron, 2 scruples; sweet spirit of sal ammoniac, 9 ounces. Digest all these ingredients in a Florence flask in a sand-heat for ten days, shaking it now and then till the last day or two, and then pour it off clear and stop it up for use."

Dr. **Warner** says, "Of this noble medicine, which no gouty man should ever be without, take thirty or forty drops, an hour before it is wanted to operate, in a glass of strong mint water, after nothing hath been received into the stomach for an hour and a half: and if in an hour or two after taking it, the pain is not greatly abated, take twenty more, and drink some time after of warm sage tea at pleasure.—The number of drops must be proportioned to the violence of the pain, and repeated every night that the pain requires it; abating two or three drops at a time, as the pain abates, till the dose is reduced to ten or a dozen, when the patient may desist at once from any more: and thus the fit, which might otherwise last a month, or two, or three, will be cured in a fortnight, and the patient enjoy ease and sleep. When the pain hath been so very intense, as that I have thought it necessary to add the second dose as above directed, and yet was apprehensive that I might be rather heated too much, from a larger quantity than the additional twenty drops, and that these might not be sufficient to answer the intention, I have joined seven, eight, or nine drops of laudanum: and in the like case I have sometimes taken fifteen drops of it instead of the second dose of the Anodyne Elixir."

2. *Purging Tincture.*

Grated rhubarb, orange peel, caraway seeds bruised, each one ounce.—Infuse these ingredients in a quart of white wine for three days: decant and take half a wine-glass full, or the quantity that will answer, when sitting down to dinner.

The above prescription is also an easy purgative in other diseases, and in cases of costiveness.

3. *Cordial for the gout in the stomach.*

Raisins sliced and stoned, half a pound; Senna, two drachms; Coriander and Fennel seeds, each one drachm; Rhubarb sliced, one ounce. Infuse these ingredients in a quart of brandy, then strain, and add a pint more to the ingredients, and after standing some time, decant and mix the first and last tinctures. The dose is four or five spoonsful in as many of hot water, to be repeated if necessary in half an hour, until ease be procured.

[I shall give my own ideas on gout elsewhere.—T. C.]

GRACULA, the grakle, a genus of birds of the order Picæ, of which there are thirteen species, of these the Paradisæa tristis inhabits the Philippine islands. It is exceedingly voracious, and has been known to swallow a young rat nearly two inches long, after beating it against the wires of its cage to soften it. These birds are remarkably fond of grasshoppers, and are said to have been imported into the isle of Bourbon to extirpate these insects, which they very effectually accomplished.

GRAFTING, a term in gardening, which signifies the taking a shoot from one tree, and inserting it into another, so that they may closely unite, and form one trunk.

The great aim of this useful art is, to propagate any curious sorts of fruit-trees, to insure the growth of similar kinds, which cannot be effected by any other method: for, as all the good species of fruit have been accidentally obtained from seeds, many of these, when sown, will degenerate, and produce bad fruit. But, when shoots are taken from such trees as bear good fruit, they will never change their kind, whatever be their stock, or the tree on which they are grafted.

Mr. **Bradley** observes, that the stock grafted on is only to be considered as a fund of vegetable matter, which is to be filtered through the cyon, digested and brought to maturity, as the time of growth in the vessels of the cyon directs. A cyon, therefore, of one kind, grafted on a tree of another, may be rather said to take root in the tree it is grafted, than to unite with it: for it is obvious that the cyon preserves its natural purity, though it be fed and nourished by a mere crab: [but the food conveyed to the graft, is certainly modified by the organs of the stock on which it grows.—T. C.]

The grafts or cyons with which this operation is effected, should be of the last summer's growth, from the outside branches; firm and well ripened; and selected from healthy trees. The graft is always the middle part of each shoot, cut to five or six inches in length, or so as to have four or five good eyes, or buds, but should be preserved at full length, till grafting time.

The proper tools and other materials used in grafting, are; 1. A strong knife for cutting off the heads of the stocks, previous to the insertion of the graft; also a small hand-saw, for occasional use, in cutting off the heads of large stocks; 2. A common grafting-knife, or strong sharp pen-knife, for cutting and shaping the grafts ready for insertion; also to slope and form the stocks ready for the reception of the cyons; 3. A flat grafting chisel, and small mallet, for clefting large stocks, in cleft-grafting; 4. A quantity of new bass-strings, for bandages for securing the grafts, and promoting their speedy union with the stock; and 5. A quantity of clay, for applying closely round the grafts after their insertion and binding, to defend the parts from the influence of the sun, winds, and wet weather, or from being affected by cold. For this purpose, a kind of stiff loamy mortar may be prepared of strong fat loam; or any other tough clay may be substituted; to which may be added a fourth part of fresh horse-dung, free from litter, and a small portion of cut hay, with a little water. well mixed: the whole should be properly beaten with a stick, and thus incorporated.

This operation should be repeated, according to the nature of the clay, and performed several times during the first day; the composition being still moistened with water for six or seven days successively, at the end of which time it will be fit for use.

There are various other modes of engrafting, which are termed whip-grafting, or tongue-grafting, cleft-grafting, crown-grafting, root-grafting, check-grafting, side-grafting; and, lastly, grafting by approach, or INARCHING (to which we refer.) Beside this last-mentioned, the following are most commonly and successfully practised:

1. *Whip-grafting*, or *tongue-grafting*, is generally performed in nurseries, upon small stocks, from a quarter of an inch to half, or a whole inch in diameter. The stock, and cyons or grafts, should always be of the same size, or approach as near to the same size as possible. They are both to be sloped off a full inch, or more, and then tied closely together. This method may be much improved, by performing what gardeners call *tongueing*, or *tipping*; that is, by making an incision in the bare part of the stock, downwards, and a similar slit in the cyon, upwards; after which they are to be carefully joined together, so that the rinds of both may meet in every part, when a ligament or bandage of bass is to be tied round the cyon, to prevent it from being displaced; and the whole is to be covered over, or coated, with the clay above described.

2. *Cleft-grafting*, or *slit-grafting*, as gardeners differently term it, is performed upon stocks from one to two inches in diameter. The head of the stock being carefully cut off, in a sloping direction, a perpendicular cleft, or slit, is to be made about two inches deep, with a knife or chisel, towards the back of the slope, into which a wedge is to be driven, in order to keep it open for the admission of the cyon: the latter must now be cut in a perpendicular direction, and in the form of a wedge, so as to fit the incision in the stock. As soon as it is prepared, it should be placed in the cleft, in such a manner that the inner bark of both the stock and cyon may meet exactly together. It is then to be tied with a ligature of bass, and clayed over, as is practised in whip-grafting, three or four eyes being left in the cyon uncovered. The proper season for this mode of grafting is the same as for the preceding, viz. the months of February and March: towards the latter end of May, or the beginning of June, the junction of the graft and stock will be completed, and the latter begin to shoot; when the clay may be taken off, and, in the course of a fortnight or three weeks, the bandages may be removed.

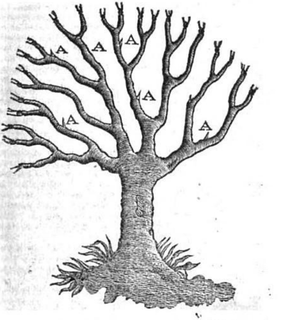
Mr. WILLIAM FAIRMAN, of Kent county, England, has inserted in the 20th vol. of the *Trans. Soc. Arts, London*, an account of his mode of "*extreme branch grafting*," upon old decaying trees, which promises to be a very great acquisition to those who take pleasure in cultivating fruit. The process is as follows:

"Cut away all spray wood, and make the tree a perfect skeleton, leaving all the healthy limbs: then clean the branches, and cut the top of each branch off, where it would measure in circumference from the size of a shilling to about that of a crown piece. Some of the branches must of course be taken off where they are a little larger, and some smaller, to preserve the canopy or head of the tree: and it will be necessary to take out the branches which cross others, and observe the arms are left to fork off, so that no considerable opening is to be perceived when you stand under the tree, but that they may represent an uniform head. When preparing the tree, leave the branches sufficiently long to allow of two or three inches to be taken off by the saw, that all the splintered parts may be removed.

The trees being thus prepared, put in one or two grafts at the extremity of each branch; and put on the cement described below, and tie with bass or soft strings. Sever the shoots or suckers from the tree, until the succeeding spring, to make good the deficiency, in case some grafts do not succeed. Additional grafts may be inserted in the sides of the branches; as at A, A, A, A, A, A, or where they are wanted to form the tree into a handsome shape.

The cement for grafting.—One pound of pitch, one ditto rosin, half ditto bees-wax, quarter ditto hog's-lard, quarter ditto turpentine, to be boiled up together, but not to be used till you can bear a finger in it.

Mr Fairman objects to the mode of grafting at a short distance from the trunk or body of a tree, as the wounds are so large as to require several grafts which cannot firmly unite and clasp over the stumps, and consequently these wounds lay a foundation for after decay; or else they diminish the growth of the tree: whereas, upon the new plan, they will be larger in three or four years, than before the operation. The annexed cut will give an idea of Mr. F's new method.



Dr. Darwin explains the theory of grafting thus: "It is the inosculation of the vessels of the graft with those of the bark and alburnum of the tree to which they are applied and bound." *Phytologia*, Sect. 111. 7.

In grafting, Dr. D. says, "it is necessary to apply the bark which contains or consists of the caudex of the young cyon, exactly to the bark of the branch into which it is inserted or applied; and then all species of engrafting succeeds, whether by excision, or inoculation, or in arching. But I suspect, that where a single bud is inoculated, it has often failed from the operator having selected a *flower* bud instead of a *leaf* bud; which probably unites its caudex to those of the stock with less vigour, and certainly dies after it has ripened its seed; or by his holding the bud in his mouth, as he ascends the ladder, or while he makes the incision, and thus destroying it by heat, as I once observed. A *leaf* bud may in general be distinguished from a *flower* bud, by its *being sharper pointed and less spherical.*"

Dr. D. has many interesting and curious remarks upon the subject of grafting, which every one anxious to perfect his fruit should read.

GRAIN, strictly speaking, signifies the fruit or seed, growing in a spike or ear; in which sense it comprehends corn of every kind, such as Wheat, Rye, Barley, Oats, &c. Of the preparation, culture, and preservation of these, we treat in their alphabetical series.

[The diseases of grain are,

Rust. Rubigo. This affects the stem, leaves, and whole plant.

Blast. Ustilago. In Italian, Puligine. In French Nielle or Culture. It attacks the flower.

Smut. Caries. In French, Charbon. Attacks the grain.

Spur. Secale cornutum. Clavus. In French, Bled corni. Ergot. It attacks the grain; chiefly of rye. The ergot is given in difficult parturition. See a good account in the "*New England Journal of Medicine and Surgery,*" vol. 5. no. 2.—T. C.]

Grain also denotes the smallest weight used, and which is thus denominated, because it is regulated by the weight of a grain of wheat, selected from the middle of the ear, and well dried. The grain is employed for troy weight, in the weighing of gold, silver, jewels, bread, and liquors.

The grain employed by apothecaries, is the same as that of goldsmiths (see Avoirdupois) though they afterwards vary with respect to the computation of greater weights arising from the aggregate of grains. Thus, with the former, twenty grains make a scruple, three scruples a drachm, eight drachms an ounce, and twelve ounces a pound.

Grain, is likewise applied to the figures or representations of grains on stones, stuffs, leather, &c. Thus we say, in some marbles the *grain* is very fine, in others it is much coarser: morocco has a richer, that is, a larger grain than shagreen, &c.

GRAINS are the refuse of malt, which has been brewed or distilled. Immense quantities of this article are consumed in London and its environs for the feeding of pigs, 100,000 of which were annually fattened, a few years since, by one extensive distiller. Cowkeepers in the vicinity of London likewise feed their cows frequently with grains, which produce indeed abundant milk, but of a very inferior quality. Hence we are of opinion that such refuse, especially that from brew-houses, might with greater advantage be employed in the process of making vinegar; for, by bruising the grains so as to reduce them to a pulp, adding the necessary quantity of tepid water, together with leaven, yeast, or other fermentable substances, they might easily be converted into a strong acid.

GRAMME, in French weights, answer to rather more than 15 grains, and the kilogramme is equal to a thousand grammes or 32 1-6 troy ounces.

GRANITE, in natural history, a genus of stones, consisting of quartz, feldspar, and mica; forming rough and very large masses of great hardness; yielding fire with steel, not fermenting with acids, and slowly but imperfectly calcinable in a great heat. The most stupendous ridges or chains of mountains on our globe, are composed of this fossil, which presents three distinct species.

1. The hard white granite, with black spots, commonly called *moorstone*. It is much used in London, for the steps of public buildings, and on other occasions where great strength and solidity are required.

2. The hard red granite, variegated with black and white, which is common in Egypt and Arabia.

3. The pale whitish granite diversified with black and yellow. This is sometimes found in strata, but more frequently in loose nodules, and is employed for the paving of streets.

Granites take a good polish; hence the Egyptians formerly employed them, and the Italians still use them for working large pieces of ornamental architecture; a purpose to which this fossil is uncommonly well adapted, as it is not liable to decay in the air. Indeed, there are columns, statues, and other monuments of antiquity erected of granite, and preserved to this day entire, though some of these relics have withstood the test of time for upwards of 4000 years!

[It is not yet settled whether granite be a stratified or unstratified rock; or whether it be formed by fire or by water. It is the foundation rock of the crust of our globe.—T. C.]

GRANULATION, the process by which a metal is reduced into grains: this is effected by melting the metal, and then pouring it in a very thin stream into cold water. As soon as the metal comes in contact with water it divides into drops, which have a tendency to a spherical shape, and are more or less perfect, according to the thinness of the stream, the height from which it falls, and the temperature of the metal. Some of the more fusible metals may be reduced to much finer grains, by pouring it, in its melting state, into a wooden box, rubbed over with chalk, and shaking it violently before it has time to become solid.

The design of granulation is chiefly to facilitate the combination of metals with other substances; because, from their great ductility, they are incapable of being pulverised, and liable to contract impurities from the tedious operation of filing. See also Lead and Shot.

Granulation is also applied to wheat when divested of its husk, and other surrounding parts, so that the heart or middle of each grain only is preserved entire. In this state, it is called *Semolina*, and often sold by grocers: it affords an excellent and nutritive food, especially for children and invalids.

GRAPES are the fruit of the Vine, on the culture of which we shall treat under that head.

Grapes are excellent fruit, but they are, however flatulent, and ought to be avoided by those who are liable to eructations, and other complaints arising from bad digestion. It is asserted, that the small stones of grapes, when swallowed together with the juice in large quantities, have occasioned the most painful and inveterate colics.

Sour grapes ought never to be eaten, as they easily produce gripes, and even the dysentery. See Vine.

GRASS, in botany, is defined to be a plant or vegetable which has simple leaves, a jointed tubular stem, a husky calyx called *gluma*, and the seed of which is single.

Grasses are divided into two classes, leguminous and culmiferous. To the former belong wheat, barley, oats, and all other grain, for the various modes of cultivating which, the reader will consult the articles in their alphabetical series.

Culmiferous grasses may likewise be subdivided into two classes, for agricultural purposes; hence it is of importance that every farmer should distinguish, 1. Those which run to seed-stalks in a manner similar to the common annual species of corn, and the leaves of which gradually decay, in proportion as they approach towards perfection, and totally wither when the seeds are fully ripe. In this division may be ranked Ray or Rye grass, to which may be added the Sweet-scented Spring grass, the Dog's-tail-grass, and the Bent grass. 2. Those, the leaves of which grow after the seed-stalks are formed, and retain their succulence and verdure during the whole season. Such are the Fescue and Meadow Grasses, that continue green and succulent, even after the seeds have attained to maturity, and while the flower-stalks are fading.

We cannot here specify the places of growth, proper soils, or the modes of cultivating the different grasses; but, as many farmers are not sufficiently acquainted with the peculiar names of those plants, and as little improvement can be made in this important branch of husbandry without such knowledge, we shall here state the proper appellations of the best *cultivated* and *uncultivated* grasses, referring the reader to the various articles as they occur in their alphabetical order.

A Table of English Grasses.

Genus I.

Sweet-scented Spring or Vernal grass—Anthoxanthum *odoratum.*

Genus II.

Mat grass—Nardus *stricta.*

Genus III.

Manured—Canary grass—Phalaris *canariensis.*
Sea—Canary—Phalaris *arenaria.*
Reed—Canary—Phalaris *arundinacea.*
Riband—Canary—Phalaris *ibid.*

Genus IV.

Green—Panic grass—Panicum *viride.*
Loose—Panic—Panicum *crusgalli.*
Cock's-foot—Panic—Panicum *sanguinale.*
Creeping—Panic—Panicum *dactylon.*

Genus V.

Meadow—Timothy, or Cat's-tail grass—Phleum *pratense.*
Branched—Cat's-tail—Phleum *paniculatum.*
Bulbous—Cat's-tail—Phleum *nodosum.*

Genus VI.

Meadow—Fox-tail grass—Alopecurus *pratensis.*
Field—Fox-tail—Alopecurus *myosuroides.*
Bulbous—Fox-tail—Alopecurus *bulbosus.*
Flote—Fox-tail—Alopecurus *geniculatus.*

Genus VII.

Feather grass—Stipa *pennata.*

Genus VIII.

Smooth—Cock's-foot grass—Dactylis *cynosuroides.*
Rough—Cock's-foot—Dactylis *glamerata.*

Genus IX.

Millet grass—Milium *effusum.*

Genus X.

Silky—Bent grass—Agrostis *spica-venti*
Brown—Bent—Agrostis *canina.*

Red—Bent—Agrostis *rubra.*
Creeping—Bent—Agrostis *stolonifera.*
Marsh—Bent—Agrostis *palustris.*
Fine—Bent—Agrostis *capillaris.*
Wood—Bent—Agrostis *sylvatica.*
Small—Bent—Agrostis *minima.*

GENUS XI.

Crested—Hair grass—Aira *cristata.*
Purple—Hair—Aira *cærulea.*
Water—Hair—Aira *aquatica.*
Turfy—Hair—Aira *cespitosa.*
Mountain—Hair—Aira *flexuosa.*
Small-leaved—Hair—Aira *setacea.*
Grey—Hair—Aira *canescens.*
Early—Hair—Aira *præcox.*
Silver—Hair—Aira *caryophillea.*

GENUS XII.

Mountain—Melic grass—Melica *nutans.*

GENUS XIII.

Middle—Quaking grass—Briza *media.*
Small—Quaking—Briza *minor.*

GENUS XIV.

Water—Meadow grass—Poa *aquatica.*
Common—Meadow—Poa *trivialis.*
Great—Meadow—Poa *pratensis.*
Creeping—Meadow—Poa *compressa.*
Narrow-leaved—Meadow—Poa *angustifolia.*
Bulbous—Meadow—Poa *bulbosa.*
Hair-leaved—Meadow—Poa *setacea.*
Annual—Meadow—Poa *annua.*
Wood—Meadow—Poa *nemoralis.*
Sea—Meadow—Poa *maritima.*
Hard—Meadow—Poa *rigida.*
Spiked—Meadow—Poa *loliacea.*

GENUS XV.

Sheep's—Fescue grass—Festuca *ovina.*
Fescue—Festuca *vivipara.*
Purple—Fescue—Festuca *duriuscula.*
Hard—Fescue—Festuca *rubra.*
Barren—Fescue—Festuca *bromoides.*
Wall—Fescue—Festuca *myurus.*
Tall—Fescue—Festuca *elatior.*
Small—Fescue—Festuca *decumbens.*
Flote—Fescue—Festuca *fluitans.*
Spiked—Fescue—Festuca *loliacea.*
Wood—Fescue—Festuca *sylvatica.*

GENUS XVI.

Field—Brome grass—Bromus *secalinus.*
Corn—Brome—Bromus *arvensis.*
Upright—Brome—Bromus *erectus.*
Wall—Brome—Bromus *ciliatus.*
Barren—Brome—Bromus *sterilis.*
Tall—Brome—Bromus *giganteus.*
Wood—Brome—Bromus *ramosus.*
Spiked—Brome—Bromus *pinnatus.*

GENUS XVII.

Naked—Oat grass—Avena *nuda.*
Bearded—Oat—Avena *fatua.*
Meadow—Oat—Avena *pratensis.*
Rough—Oat—Avena *pubescens.*
Tall—Oat—Avena *elatior.*
Yellow—Oat—Avena *flavescens.*

GENUS XVIII.

Common—Reed grass—Arundo *phragmites.*
Branched—Reed—Arundo *calamagrostis.*
Small—Reed—Arundo *epigeias.*
Sea—Reed—Arundo *arenaria.*

GENUS XIX.

Perennial—Darnel—Lolium *perenne.*
Annual—Darnel—Lolium *temulentum.*

GENUS XX.

Lyme grass—Elymus *arenarius.*

GENUS XXI.

Common—Wheat grass—Triticum *repens.*
Bearded—Wheat—Triticum *caninum.*
Sea—Wheat—Triticum *junceum.*

GENUS XXII.

Barley grass—Hordeum *murinum.*

GENUS XXIII.

Rye grass—Secale *villosum.*

GENUS XXIV.

Crested—Dog's-tail grass—Cynosurus *cristatus.*
Rough--Dog's-tail—Cynosurus *echinatus.*
Blue—Dog's-tail—Cynosurus *cæruleus.*
Bearded—Dog's-tail—Cynosurus *paniceus.*

GENUS XXV.

Creeping—Soft grass—Holcus *lanatus.*

[To these may be added,
Plaintain, or Rib grass—Plantago *lanceolata, angustifolia, tenuifolia.*
Marsh—Arrow grass—Triglochin *palustre.*
Sea—Arrow grass—Triglochin *maritimum.*

Of these, STILLINGFLEET prefers for meadows and pastures in England, the following, and in the following order, viz The fine bent: the crested dog's-tail: the sheep's fescue: the yellow oat: the vernal: the meadow fox-tail: the mountain hair: the annual, common, and great poas: the meadow fescue.

The order of flowering of some of these is as follows, viz. Sweet-scented vernal; meadow fox-tail; smooth-stalked meadow; rough-stalked meadow; meadow fescue; crested dog's-tail.

At present, in England, the following are considered as the best natural grasses, viz. Meadow fox-tail, *alopecurus pratensis:* crested dog's-tail, *cynosurus cristatus:* meadow fescue, *festuca pratensis:* smooth-stalked meadow grass, *poa pratensis:* rough-stalked meadow grass, *poa trivialis:* sweet-scented vernal grass, *anthoxanthum odoratum:* soft brome grass, *bromus mollis:* Yorkshire grass, *holcus mollis:* tall oat grass, *avena elatior:* rough cock's-foot, *dactylis glomerata:* rye grass, *lolium perenne:* annual meadow grass, *poa annua.*

These are intended for pasture and meadow grasses, and may be sown either separately or mixed. The common white clover, *trifolium repens*, is not inferior to any of them, comes up naturally, in our midland States as well as in England, when the ground is manured either with ashes, or with lime.

Of the meadow fox-tail, the meadow fescue, rye grass, vernal grass, meadow grass, meadow cat's-tail, or timothy, and rib-grass, they sow in England at present upon rich ground, from 3 to 4 bushels per acre. Of white clover, 6 lbs. Of red clover 1½ lb. Trefoil 1½ lb. Cow grass 1½ lb. sometimes a third more. Different quantities from these are prescribed in the article GRASS, in REES's Encyclopædia.

The *artificial* grasses employed to intervene between grain crops in England, are the red clover, *trifolium pratense:* lucerne, *medica*, or *medicago sativa:* sain-foin, (not *saint*, but sain; healthy or wholesome, not *holy:*) *hedysyrum onobrychis:* esprisette of the French; *vicia sativa, lathyrus*, or vetch. Cow grass is a species of red clover, *trifolium medium.*

In this country we use the timothy, *phleum pratense*, and the cock's-foot, or orchard grass, *dactylis glomerata.* Of these, it appears to me, the last is upon the whole the best, because it covers the ground best after mowing. Sain-foin has not been tried here. I have seen it tried with great success in England on gravelly soils where hardly any other grass would grow: and I have seen lucerne, the earliest and most luxuriant grass of the spring, at Col. ANTES's, in Northumberland, Penn.

But of all the artificial grasses I know, I am inclined to think the wild chicory, *chicorium intubus*, whose roots are so extensively used in Germany for coffee, is the most profitable for soiling cows and horses: it may be cut four times; and grows well in Pennsylvania. Horses are fond of it. The roots are the best of all the known substitutes for coffee.

In England they sow per acre 5 lbs. red clover, and 8 lbs white clover. Yarrow, *achillæa millefolium*, has not been sufficiently tried. Burnet, *poterium sanguisorba*, is little better than a weed. Ray grass, *lolium perenne*, is of use, as I think, only as it comes up early.—T. C.]

These are the principal grasses, cultivated and wild, which merit the attention of agriculturists; but, as their seeds, as well as those of other grasses, drop from the husks a very short time after, and many of them, before they are ripe, those who wish to preserve such seeds, ought to watch them diligently; as the neglect of a very few days will deprive the cultivator of an opportunity of collecting them. The Tall Fescue-grass, however, forms an exception: for, as its seeds are not fertile, it can only be propagated by parting and planting the roots.

The culture of grasses has been particularly attended to within these few years; and, as they support many of the most useful quadrupeds, the art of increasing the quantity of leaves round the roots of grasses, is deservedly regarded as an object of great importance. It simply consists in eating off the central stem by sheep, horses, or other cattle, early in the season: hence Dr. DARWIN justly observes, that new leaves are produced around the first joint of the stem thus grazed. This practice is especially useful in low meadows, and affords a double profit, if continued till the month of May; as, in moist situations, a crop of hay is certain to succeed, which, by this method, will not only be much finer, and more copious, but the expense that must otherwise have been incurred in providing hay, may in a great measure be saved by making use of such early grass.

The Rev. and learned Dr. HENRY MUHLENBERG, of Lancaster, Pennsylvania, has paid more attention to the natural history of the grasses of the United States, than any other person, and it is much to be wished he would favour us with the result of his valuable researches on this subject. But he has been equally attentive to the cultivation of some of the most useful species of grasses, as well domestic as imported. "According to his trials they thus range in point of merit.

1 *Tall Meadow Oats*, or Tall-oat-grass, *Avena elatior*, imported.

2. *Tall Fescue Grass, festuca elatior*, native.

3. *Meadow fox-tail-grass. Alopecurus pratensis*, imported.

4. *Meadow-soft grass*, or Yorkshire grass of the English, *Holcus Lanatus*, native.

5. *Timothy*, or Meadow cat's-tail grass, *phleum pratense.*

6. *Rough cock's foot-grass*, (orchard grass) *dactylis glomerata*, native.

7. *English or Common Rye-grass, lolium perenne*, imported.

8. *Sweet-scented-vernal-grass, anthoxanthum odoratum*, imported.

9. *Reedy Cinna, Cinna Arundinacea*, native.

10. *Broom-grass*, two species, *bromi*. Timothy should be cultivated with the nine other kinds of grass enumerated above, in bottoms or meadows, which can be watered. For upland meadows, Dr. M. prefers red clover, *trifolium pratense;* 2. Lucerne *medicago sativa ;* and 3. Sainfoin *hedysarum onobrychis*.

1. The *Tall-Meadow* oats was imported many years ago by Dr. M. and is now spreading fast through the state of Pennsylvania. It is the *Wiesenhafer franzosich ray-grass* of the Germans. The English rye-grass or ray grass is the *Lolium perenne*, a very different plant. A very good figure and description is given of the *avena* in SHERBER'S treatise on grasses, vol. 1. tab. 1. Agreeably to the experience of Dr. M. this grass is of all others the earliest, latest, and best grass for green fodder and hay. It blossoms about the middle of May, with red clover, and the seed ripens a month after. It grows best in a clover soil, and rises to a height of from five to seven feet. It ought to be cut in blossom about the end of May. The seed may be sown in the fall or spring, with or without grain, and must be brushed in, or lightly harrowed. If mixed with clover, it will make good upland meadow. Horned cattle prefer this grass to all others. But some horses do not relish it green."—*Trans. of Agric. Soc. New-York*. In addition to the above, Dr. M. informed Dr. MEASE, that the ray grass must be pastured or cut at least three times in a season; if suffered to grow old, it will become strawlike. When intended for hay, it must be salted.

2. *Fescue Grass* (Tall.) A native perennial grass of the United States. It is very luxuriant and productive, but rather coarse. Cows are fond of it, but horses do not relish it. It grows in moist meadows and in woods. The leaves are broad, stem very high (sometimes six feet), flowers in July.

3. *Meadow-fox-tail grass, Alopecurus Pratensis*. Root perennial, stalks from a foot to 18 inches high. Mr. SWAYNE says it suits low meadow grounds or boggy places which have been drained. Sheep, horses and goats eat it, but cows and hogs are not fond of it.

4. *Meadow soft grass Holcus Lanatus*. The root is perennial, stems from two to three feet high. The velvet-like softness of this plant, and the redness of the opening panicle, render it very conspicuous in the field. This grass is esteemed by Mr. MARSHALL, (*Rural Economy of Yorkshire*) as excellent for promoting the growth of young heifers, and cattle of every kind, but not good for horses. Indeed it has been accused of exciting the discharge of a morbid quality of urine in horses. *Young's Annals*, vol. 20, p. 105.

5. *Timothy Grass. Phleum Pratense*. A well known favourite and native grass of the Northern and middle United States. According to Mr. STRICKLAND, (*Trans. Board of Agric.*) it is the same as the English *Cat's tail grass*, except that the Timothy is about a fortnight earlier than the cat's-tail, the effect of the change of seed and climate.

Timothy suits a moist low ground, and if somewhat shady it may be sown *alone*. On upland it is generally sown with red clover, but as these grasses ripen at different periods, it certainly is bad economy to sow more Timothy than will answer to support the clover which is very apt to lodge. But as a combination of Timothy and Clover is preferred by horses, and the former tends to correct the tendency of the latter to injure their wind, the best way is to sow it with grain, to roll the ground and to permit it to stand alone after the grain comes up. It may then be mixed with clover hay in alternate layers.

The Timothy will grow about four inches high in the autumn, and in the succeeding spring the grain will shelter it from the sun, until after harvest, when it will have acquired sufficient strength to bear the heat of our summers. The first year, after grain harvest, it may be lightly pastured, but the second year it must be kept up for hay, of which it will yield an abundant crop if the ground has been well prepared. It may be pastured afterwards, and if the land be manured every spring will keep in the same ground many years.

Timothy is commonly cut too soon, that is, before it has blossomed; it is then bitter and apt to bleed, which weakens the stalk and frequently occasions the death of the plant; but if permitted to stand until in full blossom, the young leaves will be seen coming out from near the surface, which, if the grass be then cut, will start up with vigour, stand the sun, and yield a fine pasture.

It is a common opinion among farmers, that Timothy hay is better for being heated, or mow-burned: but Mr.

Joseph Cooper assures us that this is a mere prejudice, and unfounded in fact. He justly remarks, "that cattle are the best judges of good hay, and that repeated attention to the subject has convinced him that they will seldom if ever leave any part of bright Timothy hay which may be put before them, while, on the contrary, a part of mow-burned hay will frequently be left. He also adds an important fact: viz. that bright hay, even if made of coarse grass, will give yellow butter, while the best Timothy hay if mow-burned, will always produce white butter."

One acre of Timothy hay will yield thirty bushels of seed, and on good upland, two tons of hay.

Timothy is spoken of in terms of contempt by Swayne, Sole, and other practical English writers, the reason of which is, that the heat of the sun in England is not great enough to bring this plant to perfection.

[The next grass however (orchard or cock's-foot) is gradually taking the place of Timothy among the best farmers about Philadelphia. The Timothy after being mown, shoots up again so weak and sparingly, that it leaves the soil liable to be scorched and burnt up.—T. C.]

6. *Orchard Grass, Rough Cock's foot grass, Dactylis Glomerata.* Is a native of the United States, and is a strong robust and productive plant. It is ripe before Timothy, flourishes well in orchards in the shade, (whence its name,) and lasts three years. It should be cut when young, either for hay or fodder, as its stalk becomes coarse when permitted to grow old. Sole in the 9th vol. of the *Bath Society Trans.* says it is refused by all cattle; but from this assertion, and from what he says of our favourite *Timothy*, he cannot be received as an authority for American farmers. It is said that the American orchard grass is different from the grass known in Europe by that name.

7. *Ray-Grass, Lolium perenne.* Wiry, with little foliage in upland pastures: but in rich meadows its foliage is abundant, and of rapid growth. It is an early grass.

8. *Sweet-scented Vernal Grass. Anthoxanthum odoratum.* Is common in our meadows, grows to the height of ten inches: it is an early grass and delights in moist soils.

9. *Reedy Cinna. Cinna arundinacea.* A grass the size of oats, root perennial.

Holcus odoratus. Seneka grass of the western country. It is also a native of Europe and Asia. The root is perennial, jointed and creeping. This grass has a sweet smell, and collected in some places to lay among clothes and linen, and hung over beds, according to Linnæus, to procure sleep.

Green Grass, Poa Viridis, is a native of the United States, and especially of Pennsylvania, where it grows in all meadows and rich soils. Dr. Muhlenberg says, it is not described by Linnæus though nearly allied to his *poa angustifolia.* It may be easily known by the following description. "Culm (or haulm) erect and round (columnar) pannicle diffuse, spicules five flowered and hairy at their base." Cattle are very fond of this grass, if cut when the blossom opens. It produces less than *Avæna elatior* or tall meadow oats, but horses prefer it. It continues green until even after frost, and when all other herbage is destroyed; and if manured, will continue for ever. The fine grazing farm of Mr. Wm. West of Upper Darby, Delaware county, consists entirely of this grass. Mr. W. finds it necessary to sow clover thinly upon the green grass sod every three or four years, to correct a slight tendency which green grass has to bind the soil. When the *Green Grass* appears upon meadows made by banking out rivers, care must be taken to secure a supply of water; otherwise, according to Mr. J. Cooper, the ends of the seeds (not the tips of the blades, as before stated,) will become affected with a black spear, about one fourth or one half inch in length, similar to the smut on rye, and cause a loss of the hoofs of cattle that eat the grass.

Blue Grass, Poa compressa, L. *Rehwasen* of the Germans, a native grass of the United States, having "a compressed oblique culm (or haulm) panicle squeezed, spicules round, (columnar) and eight flowered." This is eaten tolerably well by cattle when young, and remains green until after frost. It binds the soil in the course of three or four years, so as to require ploughing up. This is often mistaken for the green grass, and both are called occasionally *Spear-Grass*, and wire grass.

Having already fully treated on clover both red and white in vol. 1. there remains nothing to be said, except that wood ashes or lime have been found in Pennsylvania and Delaware the best top dressing for land which it is wished to bring into white clover. To sheep-raisers this fact is important; as white clover is known to fatten sheep speedily, and to give a fine flavour to the meat.

Herd-grass. White top, Foul meadow grass of East Jersey. Dr. MUHLENBERG thinks this grass is the *agrostis stricta* of WILDENOW. It is particularly adapted to wet low grounds. It mats and consolidates the surface, continues many years, excluding every other grass, and all weeds. Many worthless swampy spots in the low parts of the state of New-Jersey have been rendered valuable grazing grounds by this grass, loaded wagons having passed over places, which two or three years before sowing it, would scarcely admit an animal to walk through without sinking. It makes excellent hay, and cattle are said to prefer it to that made of either clover or timothy. It is more succulent than timothy, though not so coarse. The same bulk of herd-grass hay, will weigh one third more than the same bulk of timothy hay. Four tons is a common crop from one acre. It yields no second crop, but affords excellent late and early pasture. It was first brought to New Jersey from New England by the late WILLIAM FOSTER, who resided near Mount Holly; and introduced into Pennsylvania about ten or twelve years since.

The *Red Top* and *White Top*, are only varieties of the above species of grass. The latter is the larger of the two. The red top is particularly valuable, as it will grow and sod the first year on banks, when no other grass will thrive.

Lucerne, Medicago Sativa. The Hon. ROBERT R. LIVINGSTON has recorded some original and highly valuable experiments upon Lucerne, in the *Transactions of the Agricultural Society of New York;* by which it appears that it may be easily sown on a dry soil with oats and clover, and that its annual clear profit after deducting every expense, will exceed on the two first years 7*l.* per acre. The ground must be highly pulverised to insure a good crop. He found also that it answers very well with red clover, and that it braves biting frosts of the spring, and the keen autumnal blasts, better than clover, or any cultivated grass of this climate. In England the deficiency of heat, prevents the lucerne from coming to perfection until the third year, hence the necessity there of sowing it in drills to keep down weeds. In warm situations, lucerne when sown with clover will be fit to cut before the clover rises to the scythe. The second crop in this case will be earlier, on account of the clover, which will consist almost wholly of it: because having escaped the wounds which the lucerne received, it will be ready to take the field before the lucerne has recovered from its amputation.

Mr. L. advises as the result of his experiments:

1. Never to sow on ground that is not perfectly pulverised.

2. Not to sow till the earth has acquired a degree of warmth friendly to rapid vegetation, viz. in *May*.

3. To sow with no crop that will probably lodge.

5. If sown with buckwheat, to apply no gypsum or other manure, till the buckwheat be off.

5. When the quantity sown is small, and the farmer can afford to lose a crop, to give the ground one turn in the autumn, another in April, harrowing it fine, and a third the beginning of May, and then if the weather be mild and warm, sow, if the ground be in perfect tilth, otherwise give it another ploughing. Eighteen or twenty pounds of seed are not too much. Mr. L. prefers ground that had been manured and bore a potatoe crop the year preceding; but another mode by which the seeds will come up quicker, and with more regularity, is to manure early in the spring, and to plough and harrow the ground firm, when the weeds have sprung and got some head, and when the earliest kinds begin to blossom, plough again, and harrow fine; repeat this four times by the first of July; then the lucerne seed should be sown when the ground is dry, and rolled in: if committed to the ground when moist, the seed will swell, and if a dry season succeeds before they have struck root, they will wither away.

When lucerne turns yellow, it must be mowed, as the plants will come up free from the disorder.

Dr. MUHLENBERG sows lucerne alone, like clover, after potatoes or Indian corn, or in preference after cabbage crops, about the second May, and observes, that when it can be fed green, it exceeds any other grass, and is very early.

The following observations on this valuable plant, and on other useful grasses, by Mr. DE LA BIGARRE, are taken from the *Trans. Agric. Soc. New York*, and being the result of experience, deserves serious attention.

"Amongst a great number of grasses used for artificial pastures, I thought it my duty to select those which I presume the most suitable to this state, and most friendly to cattle, as far as I am able to judge, from my experience of the country.

This essay will be extended only to four of the perennial, considering the three others as annual, and less useful, which therefore require a separate treatise.

Lucerne.—It is not true that lucerne can grow every where: it requires a light but substantial ground, not too dry nor too wet: it delights in a deep and gravelly soil, or rich sand, where it may root down easily, rather upon a level spot, than on mountains or declivities. As much as possible I would choose a situation sheltered by woods or hedges from the cold winds in the winter, and from burning breezes in the summer.

Tillage and Sowing. The ground intended for lucerne, must be ploughed twice before winter, fifteen inches, or at least a foot deep.

In the latter end of March you plough it again, and dress it with a harrow before the day of sowing: the seed is buried in the ground by the harrow, taking care to fix chatwood or branches under and betwixt the teeth, in such a way as to facilitate the covering of the seed, without going too deep into the ground.

There are two ways for the sowing of lucerne: the first, by itself, which is the best: the second, mixed with barley or oats: but observe not to mix lucerne with any other perennial.

Whether lucerne is sown by itself, or mixed with barley, take twenty puunds weight for an acre. If you choose to sow it with barley, take the exact measure of the quantity of barley which you are used to sow upon an acre; then put in that measure twenty pounds of lucerne seed, fill it up afterwards with the barley, that process will establish the just proportion.

If you intend to sow lucerne by itself, fill up the measure with sand or ashes over the above-mentioned quantity of seed, that method makes the sowing easier and more regular.

When your barley is ripe, you may mow it as close as possible to the ground without any danger of hurting the young plants of your lucerne, of which you cannot expect but a very indifferent crop the first year. Do not let cattle feed upon it at that time.

The second year will give you two crops. In the beginning of the third year, as soon as the winter is over, you must barrow your lucerne about two inches deep when the ground is yet moist, in two or three different directions, in order to root out the weeds: Never mind nor be uneasy if your lucerne is torn to pieces by that hard dressing: the more it is torn the better it will grow: this is a fact of long experience upon which you may rely.

Manure. After the above dressing, you may manure your lucerne with greater advantage, by spreading over some new ground or mud taken from creeks and swamps, or employ some pulverised gypsum.

The best manure for lucerne which I know, is the dung of fowls and pigeon-houses, well dried by the sun, and reduced into powder; but it seems very scarce, and too difficult to be got in this country, although a great deal less of this last manure would be required, as in the proportion of one to nine. Dung of cows, horses, or of any other cattle, ought to be rejected as bad manure, upon lucerne, because they bring with them such a quantity of weeds, as to poison the best lucerne in the course of two years.

Produce. The third year the lucerne has acquired its full strength, then upon a common average one acre will produce, *viz.*

The first crop,	2500 weight.
The second,	1400 do.
The third,	600 do.

After the third crop, let it be fed upon by your cows all the remainder of the fall.

Such a piece of lucerne will last from nine to ten years: but however great may appear the profit of that culture, there is a greater one after the lucerne is worn out: I mean the richness afforded to the ground by the roots of that plant: which is such, that the first year the lucerne has been ploughed up, I was never able to raise wheat, which grew too rich, tall, luxuriant and lodging. Instead of wheat, then you must sow barley or oats.

Mowing. The most proper time to get good and tender forage, relished by the cattle, is to mow lucerne when in full blossom, or a little before the ripeness of the seed.

Another advantage of mowing early, is to have the weeds cut down, which otherwise would come to seed, and spread over the field.

When the weather is clear, one or two days are sufficient to dry your lucerne hay; and by spreading over each row a thin bed of any straw (that of oats and barley is the best) you may carry your lucerne to the barn, without any danger of being heated or rotten. The straw so intermixed with lucerne, receiving the juicy emanations of it, becomes more palatable, and is eaten like the best hay by cattle. It would be needless to observe what increase of food that process affords to a farm.

Disorder. In some uncommon summers, it happens that lucerne is attacked by caterpillars, or other insects. When this is the case, and you perceive the stems and the leaves turning pale, yellow, or fading, the only and best remedy is to mow instantly your lucerne, which will soon grow again, fine and free from those insects.

Sainfoin. It may be ascertained that sainfoin, considered like hay, is one of the most friendly foods to neat cattle; horses are particularly fond of it in the winter, when it furnishes them so strong a nourishment as to be a good substitute for oats.

It grows upon any kind of soil, except upon stony ground. Its most advantageous quality is to succeed in the poorest land, sandy loam, and upon declivities, of which it keeps the ground.

Tillage and Sowing. Two tillages as deep as possible, according to the nature of the ground; never mind if the plough turns up a part of that reddish and yellow stratum which they call unvegetable among the farmers.

It is sown by itself, or mixed with the same grains pointed out for lucerne; but as the seed of sainfoin is bigger than that of lucerne, the mixture must be in proportion.

Manure. Any kind of well-rotten dung, or any pulverised gypsum, will increase the crops, though it may do without. When it is three or four years old, a good harrow-scratching cannot fail to be of service.

Produce. It will be according to the soil, commonly two crops. The first richer than that of any other grass: The second less, in the proportion of one to nine; because you cannot mow the sainfoin as early as you do lucerne. If you wish to make a strong food for your horses, you must wait till it is grown up in seed for the first crop.

Mowing. I would recommend the method pointed out for lucerne, as the most profitable.

Longevity. Sainfoin is in full strength the third year, and will last from nine to twelve years, sometimes more, according to the soil and exposure.

Disorder. It is not liable to be destroyed by any kind of insect, as far as I know from an experience of fifteen years. Its mortal enemy is a flock of sheep, particularly when it is young.

Esparcet. This grass, unknown I believe in England, may be classed among the plants of perennial kind, and more like the sainfoin than any other. It has some peculiar advantages. It may be sown in every month of the year, except in time of snow or frost, growing upon every soil, it roots very well through stiff clay, stony or hard red gravel, provided the ground has been ploughed as deep as possible.

Manure. The same as for sainfoin.

Produce, Mowing, &c. Though it would afford a crop nearly like that of sainfoin, I preferred keeping it for constant pasture; and in that way I have seen one of twenty-three years old, producing as fine grass as any young meadow. It is remarkable for keeping up the ground upon declivities. No disorder.

Pimpernel. This perennial plant, which I would rather call immortal, on account of its long continuance, highly deserves to be introduced into this country. It is capable of withstanding the severest cold, as well as heat; besides it grows as well upon the top of mountains as in plains and vallies: it delights above all in light, gravelly or calcareous soils. This vivacious plant has the power of destroying every other kind of grass or weeds. It keeps green all the winter, and the cattle are so fond of it, that whenever they smell it, they soon remove the snow to get at it. Whether eaten dry, green, or wet, it never hurts the cattle: Its nutritive qualities differ from those of other plants of the same class; for instead of heating, it refreshes. Give me leave to submit to you a single instance, recommending this plant better than any other description.

In the province of Berri it was known and remarked long ago, that all the sheep who fed upon certain meadows full of wild pimpernel, had finer wool. In consequence, a gentleman of my acquaintance took the trouble to cultivate a piece of ground with that pimpernel, and his success has confirmed beyond any doubt our preceding remark. He bought twenty poor wretched sheep, who never had before but coarse and common wool. In the course of the first year the alteration in the wool was sensible, and the little flock was bearing a good and healthy appearance. Not further than at the third shearing, the wool was so fine that it fetched one-fifth above the common price.

In short, this plant, whether as hay or in grass, affords the most relishing food to horses and cows; these last give much better milk.

Tillage and Sowing. The ground must be well ploughed at least six inches deep, once in the latter end of September, the second time in October. Then twelve pounds of seed will do for an acre, if the ground is good, add to it as much sand or ashes, and sow it as you do lucerne.

Manure. It may do without; but gypsum and any kind of dung would by all means increase the crops.

Like lucerne, this grass will receive a great benefit, by being scratched with a harrow, every other year in the beginning of March

Produce. Commonly three crops like lucerne, if it is reserved for hay. Is also mowed like lucerne, and perennial."

Those of our readers who wish to acquire more minute information respecting the English native grasses, we refer to Mr. SWAYNE's excellent Treatise, entitled, "*Specimens of Pasture Grasses;*" a work replete with information.

The following paper on ARTIFICIAL grasses, by ARATOR (Col. J. TAYLOR), deserves attention.

"It is universally agreed, that a constant impoverishment of land must ensue from tillage, without the renovation produced by manure and vegetable matter—hence, the cheapest and most ample supplies of these renovators is a primary subject: as neither the improvement nor preservation of the soil can be effected without using the means. It was seen as early as in the time of Columella, that the efforts of nature to furnish us with these means, without the aid of culture and art, were incompetent to the end; and nearly equivalent in value, to the spontaneous supply of food by the wilderness, compared with the supply from industry and cultivation. Writers reason from this discovery as an axiom, and prove that the fertility of old countries bears a strict relation to the use made of it. Egypt itself owes its fertility to its annual alluvion manuring. Thus the culture of artificial grasses attracted great attention, wherever a system of agriculture existed, worthy of any degree of commendation; it being seen that the prosperity of nations, as well as of farmers, was evidently graduated by the degrees of skill and industry, with which this axiom was practised upon; and that they were the chief means for its practical effect. Whilst a country is fresh, and the soil saturated with vegetable manure, it constitutes a temporary case; and a vast extent of uncleared lands, will long keep out of view, the means for preserving the good, and improving the exhausted But when it has passed the vigour of youth, and exhibits the marks of old age, the alternative of reducing it to barrenness, or of adopting the only mode in existence for restoring its fertility, lies before the eyes of its inhabitants. Excepting a few strips of alluvion land, there is no cultivated country, in which a dependence upon the natural grasses is more hopeless than in Virginia. A thin soil, exposed to hot and dry summers, not only prevents our lands from clothing and nourishing themselves, but has at length rendered them even unable to raise working animals for their own cultivation, and a sufficient supply of meat, milk and butter for their own cultivators. A remedy for this state of things, is necessary to stop the emigration from Virginia, and to prevent its ultimate depopulation. If the culture of artificial grasses is the chief remedy, it can only be overlooked, because it is not embellished by the glittering ornaments of novelty, and only assumes the plain garb of reason and experience.

"Before the effects produced by a skilful culture of the artificial grasses are enumerated, let us take a glance at them, collectively, in other countries. In Holland, where the cultivation of grass is generally preferred to that of bread, land sells higher as land, without having its price enhanced by adventitious circumstances, than in any other country. The industrious and profit-loving Dutch, choose rather to import, than to raise their own bread stuff, at the expense of diminishing the culture of artificial grasses. They are as little likely as any people in the world, to make an election by which they would lose money. In England, the cultivation of grass is so much more profitable than that of bread-stuff, as to have obtained a preference, at the expense of considerable importations of the latter. The bearings of this fact are weighty. Hay and butcher's meat in England, are nearly of the same prices as in this country—whereas, wheat there, is often three times dearer than wheat here, and seldom less than double in price. Yet the English farmers prefer raising artificial grasses, to raising wheat. Again, the rent as well as price of land, is constantly highest in those countries, where the culture of artificial grasses is pushed farthest. In England, the rent of fine artificial meadows, sometimes extends to twenty dollars an acre, rarely diminishes to ten, and is never as low as the rent of adjoining arable land, however good. As the rate of rent is settled by the rate of profit, it follows that even there, where the prices of meat and hay approach much nearer to our prices than the price of wheat, it is most profitable to raise the articles of inferior price. Much light may also be extracted, from a comparison between the general rate of rent here and in England. It must be our best land, which would rent at one dollar an acre for a term of twenty-one years; and even at this low rent, both the land and the tenant are generally ruined. In England, much of the arable land rents at about ten dollars an acre, and its average rent is about six. But there, the culture of artificial grasses, is invariably mingled with the culture of grain.—Now when we see the best grazing land there renting higher than the best arable land, and their farms renting ten times higher than ours, does it not plainly follow, that both a great profit and a vast improvement of the soil, must arise from the culture of artificial grasses; and that the difference in rent between their farms and ours, is in a great measure produced by the latter circumstance? This conclusion is warranted by the fact, that the longer the term of a lease is, the higher is the rent there, and lower here; because the tenant in one case, calculates upon a mode of tillage which will improve the land; and in the other, upon its becoming poorer. What but the use of artificial grasses, and their exclusion, has made both these calculations correct?

"Let us now resort to indigenous facts. Lands sell and rent higher in the United States, in proportion to the extent and skill with which artificial grasses are cultivated. There is no doubt, but that here, as abroad, profit is the only permanent basis of price and rent; and as the highest price and rent attends the culture of artificial grasses, the greatest profit must also attend it. Both at home and abroad, the land nursed by artificial grasses, is known to be so much richer and productive, both of grain and meat, than lands not so nursed, as to pay labour far better, without taking into the account a long list of other benefits arising from this system of culture. The most productive bread-stuff farms, are those whereon grain is raised on grass lays. Of this fact, the slightest observation, experience or reflection, would convince the most incredulous.

"The general conclusion, that grazing ruins land, as we know from experience, when applied to natural grasses only, but enriches it when combined with a skilful management of artificial grasses, as in the cases of Holland, England, and some parts of the United States; suffices to excite those who love their country or themselves, to inquire after the practical modes of a system, which experimentally enriched us both, and solicits an attention to the distinct items of profit, by which these desirable ends are produced.

"1. The phrase 'artificial grasses' implies a selection from the gramineous family, and a culture by human art, of the kinds best adapted to the soil and climate of a country, in preference to a reliance upon the grasses produced naturally. The great value of this selection, is illustrated by the contrast between the crab of the wilderness, and the cultivated pippin of the orchard; or by a comparison between the esculents of a garden and those of spontaneous production.

"2. An improvement of the soil by the culture of artificial grasses, arises from the vegetable matter of both root and top, when ungrazed; from the former when grazed; from protecting the ground against heat in summer and cold in winter; from producing food to raise animal manure; from rendering the ground fit to bear deeper ploughing, by reason of the mass of vegetable matter mingled with it, that it can bear in a naked state; by which its soil is deepened; and from saving four-fifths of the farm from the hoof and the tooth, by making one-fifth far more adequate to supply the demand for grass, than the whole without such culture.—The profit arising from this improvement of land by the use of artificial grasses, is exhaustless and incomputable.

"3. Artificial grasses enable the farmer to raise meats of all kinds, for his own use or for market, of the best quality, in the cheapest modes; and to increase the size of all animals destined to slaughter or labour. The latter, by being raised in the climate where they are to work, are hardier, healthier, and better adapted for their employments. And whilst the farmer saves the expense of purchasing sorry meat and teams, he gets good without expense; because by a skilful management of artificial grasses, the manure they cause domestic animals to produce, will more than repay in the improvement of soil and increase of crops, the expense of their maintenance. This item of profit is too important to be hastily passed over.—Men chiefly subsist upon grain and meat; brutes, upon grass, green or dry. The difference between the expense of cultivating an acre of grain and one of grass is inconsiderable, and yet the latter will raise far more meat, butter, tallow, leather, and wool. Let any farmer calculate the expense of supplying himself with these articles, in the present mode, even excluding its heaviest item, (that of injury to the land,) and he would probably discover that most or all of them he raises cost him three times their market value. The loss, however, upon what he sells, is trifling, compared with the loss upon what he uses; because he consumes much and sells little. When the temporary supplies from the western country diminish or fail, the evils attending upon our present mode of raising stocks, will require no proof. The arts of agriculture are as necessary to improve and increase the sustenance of beasts as that of men. Grass being the basis of food in the case of stocks, as bread-stuff is in the case of man, that mode of obtaining it which produces the most and best, with the least injury to the land, and from the smallest space, is entitled to a preference. Without the cultivation of artificial grasses, our domestic stocks occupy the precise ground occupied by mankind, when excluded from the artificial modes of raising bread-stuff, and experience the fate of a state of agriculture, as to them, uncivilised.

"4. The artificial grasses produce a considerable profit by saving labour—If the labour applied to an acre enriched by artificial grass, was equal to that expended upon an impoverished acre, a vast saving would still result from the difference of the crop; as the expense of labour must be computed in relation to its produce. But the fact is, that the poor land requires the most labour, whilst it produces the worst crop, because being filled with seeds of worthless or pernicious annual grasses or weeds, and being incapable of bearing a ploughing sufficiently deep to deposit these seeds beyond the reach of vegetation, it requires double the work to destroy them, as they sprout and grow after every rain, which would suffice if they were extirpated. This cannot be effected on poor land without killing it. On such, the wheat which follows corn, though the corn required and received six or seven workings, is always more infested with annual grasses and weeds, than that sown upon only a single furrow turning under good perennial grasses, because they smother all annuals, and any seeds of the latter remaining, are buried by one deep ploughing, which the earth is able to bear below the reach of vegetation. Hence in the culture of corn upon a perennial grass lay, as in a fallow for wheat, half the labour required by poor lands may be saved; because but few of the annuals appear after one deep ploughing, and as the perennials hardly appear at all in the summer, very little culture is required; and the crop is not only increased by the artificial grasses turned in, but by being freed from the frequent laceration of its roots, caused by frequent ploughings necessary to keep under the quick growing annuals infesting thin land. The wheat also following corn planted on a perennial grass lay is cleaner: for although the perennial grass seeds will often sprout in the spring, and although they ought universally to be sown with or upon the wheat, yet a providential aptitude for the benefits they bestow, is discernible in their slow growth until the wheat crop is perfected; whereas the annuals often grow as rapidly as the wheat itself. There are many weighty items of profit belonging to the labour-saving article, by the culture of perennial grasses. By diminishing arable space, whilst the crop is increased, the diminished space consumes less labour.—From a division of the objects of labour, a succession of employments ensues, enabling a farmer to prevent either from suffering by the want of cultivation in due season. For instance, a full crop of corn and wheat, or a crop equal to the whole labour on a farm, is the consequence of comparing labour with space; and a great demand of both crops for labour at the same period, especially if aggravated by unpropitious weather, generally produces some neglect, and often a considerable loss.—By diminishing space, not only without diminishing, but actually increasing produce, these crops will be more manageable by the labour, and receive a better cultivation. And the time saved by this diminution of space, is moreover profitably employed early in the spring, in applying manure and sowing grass seeds; previously to the wheat harvest, in making hay; in autumn, in ditching and draining, fencing and stubbing; and at all times in a variety of less important, but improving occupations. Thus the losses accruing both from a surplus of labour at one season, and from its deficiency at another, are avoided. Some labour is saved by the effect of the roots and tops of perennial grasses, to keep the ground loose and friable; and much, after it is thrown into high ridges of five and an half feet width, because when the ridges are reversed, very deep ploughing is more easily practicable, by turning the earth back into the furrows without working at all on the space these furrows occupy. By the friability of the ground, resulting from a great quantity of vegetable fibres, we are also secured against its baking, and save the labour necessary in that event, for crumbling or reducing it again into a proper state of vegetation. Naked ground possesses neither of these advantages. It is unable to bear the deep ploughing necessary for forming proper ridges, and it is liable both to wash and bake from heavy rains, so as to require much severe labour again to level and pulverise it, highly prejudicial to the crop.

"5. But the greatest benefit from the cultivation of artificial grasses, arises from their exclusive capacity to make highland meadows. Some grasses are so well adapted for high, dry, and hilly land, if the soil is improveable, that it may very often be made more valuable and more productive than low land meadows. The expense of clearing and draining the latter, will generally exceed that of manuring the former; yet draining is considered every where as highly profitable and useful. The comparative expense between that and making highland grass, is not materially affected by the probable comparative profit. A good spring crop of high land grass is more common in our climate, than of low land. It is not exposed to inundation. A pound of high land grass, green or dry, generally contains as much nutriment as two of low land. It is more easily made into good hay. —And high land grasses possess the great exclusive value of enriching the high and dry lands on which they are sown. These considerations disclose items of profit, resulting from the culture of artificial grasses, which, when united, warrant the conclusion, that it is capable of rendering a great proportion of our high, dry, and hilly lands, as valuable as reclaimed meadow land.

"It is next to be considered, what grasses are best adapted to the soil and climate of Virginia, and consequently most worthy of selection. The merit of red clover as an improving high land grass, is too well established to require proof. Its defects are, that it is speedily destroyed by grazing; bearing, however, that of hogs the longest; that in our warm and dry summers, it soon perishes without being grazed, especially on sandy soils; that it is difficult to be made into hay, and that its hay can only be preserved by particular exertions. It stands, however, hitherto unrivalled in its capacity to enrich the ground, if left uncut to be turned in by the plough. Timothy, in the lower parts of the state, especially if grazed, is also liable to an early death; to be eaten out by broomstraw, to have its leaves burnt and dried by the sun before it is fit to be cut; and to ripen so late as to incommode the wheat harvest, without possessing the quality of waiting long for the scythe. In the section of Virginia below the mountains, it must also be assigned to the class of low land grasses. The red top, or herd's grass, as it is indiscriminately called, is superior to timothy in many respects. It lasts longer, it bears grazing better, its leaves are not so liable to be sun-burnt, it resists invaders much more powerfully—sown, mixed with timothy, it casts out the latter in two or three years, and although it ripens about the same time, it waits longer for the scythe, without sustaining any considerable injury. This grass, like timothy, is better adapted to reclaimed low lands than to high, though it succeeds on the latter better than timothy. The best grass which I have tried, in many respects, is one commonly called 'the high land meadow oat.' I have had no means of ascertaining whether it is a species of rye grass, or of the avena pratenris, or neither, nor whence it derived the appellation "Peruvian," by which I have heard it distinguished. With its qualities I am better acquainted, having carefully observed them for many years. It ripens as early as the red clover, and is easily made into fine hay, if cut in proper time. Its earliness is of vast importance in our climate. Thence it happens, that it produces heavy spring crops, like red clover, as it commonly perfects its growth before a drought occurs. It is the hardiest grass I ever saw, and bears drought and frost, heat and cold, much better than any I have tried. It keeps possession of the land in spite of severe grazing. It flourishes best on soils suitable for red clover, but it will live on and improve lands whereon red clover will perish. It furnishes better grazing early in the spring, late in the fall, in droughts and in winter, than any grass known to me. Ripening with the red clover, it is peculiarly fitted for being sown with it, because it greatly facilitates its conversion into hay, and retains possession of the ground for years after the clover has disappeared. Alone, cut before the seed ripens, its hay is as nutritive and pleasant to stocks of all kinds, as any I have ever used; and it will yield both seed and tolerably good hay at one cutting, as it ripens soonest at top. Mixed with favourite grasses of grazing animals, it is partially rejected, but eaten as they fail. Alone, it is greedily fed upon. After being cut or grazed, if left to grow, it rises anew, almost with the rapidity of lucerne, with a vigour but little diminished. Fifteen years experience has not enabled me to decide as to its capacity for improving the soil, because the small quantity of seed first obtained, by confining experiments to small patches, long concealed its qualities; and the large lots first sown have remained too flourishing to require manure, and too valuable to be ploughed up. It produces (after it has come to perfection, in doing which it is one year slower than red clover,) ungrazed and uncut, a warmer and more lasting cover than the clover, which has recently induced me to mix and sow it with wheat on a large scale, for the end of improving the soil, in which anticipation I have yet discerned no cause for apprehension. For this purpose, it possesses one recommendation beyond clover. It does not grow and spread so rapidly in the fall or spring, as to injure the crop of wheat with which it is sown, as is sometimes the case with clover. Upon the whole, whatever doubt remains as to its fertilising power, the conclusions that it eminently possesses the qualities for lasting, grazing, and making high land hay, may, I think, be confided in. But it does not, so far as my trials have extended, succeed in lands originally wet, however well they are drained.

"As the end designed to be produced by the previous observations, comprises their value, a plan for the management of a bread stuff farm, combined with high land meadows and artificial grasses, is the remaining subject suggested for consideration. Let us suppose a farm to consist of one thousand acres of arable land; that the greatest produce of bread grain, not in one year only, but in a course of years, is the chief object; and that the labour on it is adequate to its cultivation in the three-shift mode, that is, to having two thirds of it annually in corn and wheat. To discover whether the profit to be expected from this style of cultivation, will be equal to that arising from the system presently to be proposed, we must first glance at its defects. It impoverishes the soil. Grass seeds cannot be beneficially sown with or upon the wheat crop, because the land is too poor to nourish them, and their destruction by the plough returns too rapidly. Pasturage is scarce, bad and impoverishing to the land; and the farmer is thereby disabled from raising within the farm, teams, meat, milk, and butter, for his own consumption and comfort, and moreover exposed to annual expenses to supply the deficiencies The labour being computed by space, and not by produce, and a great demand for it being concentrated in one portion of the year, losses accrue from its insufficiency to meet temporary pressures, and at other seasons for want of beneficial employment. The crop computed by the acre is, upon an average, surprisingly small, whilst as much labour is necessary for its cultivation, as, differently managed, would in a few years increase it per acre four-fold. Let us contrast this abridgment of the three-shift system, with an abridgment of that proposed to be substituted for it.

"Let eight hundred of the supposed thousand acres be divided into four shifts of two hundred acres each, one to be annually cultivated in corn and sown in wheat, so that two will yield a crop every year. As much as possible of each shift should be manured the year it is planted in corn. This may be extended in a few years to one hundred and thirty acres, (exclusively of the twenty presently mentioned) by ordinary management. Clover should be sown on the wheat in the spring, or meadow oat with it in the fall, and these eight hundred acres should remain ungrazed; of course, four hundred lie untouched for two and an half years, to allow time for a large produce of vegetable matter, devoted to the improvement of the soil. Let the remaining two hundred acres be appropriated chiefly to grass, and be divided into ten equal lots, one to be highly manured annually and cultivated in pumpkins, potatoes, peas, cotton, turnips, or any cleaning crop, to be followed by wheat, and grass seed, if these crops are gotten off in time to sow wheat, or by oats and grass seed, if they are not. Thus two lots, or forty acres of this portion of the farm, will produce each year heavy and valuable crops, whilst a rotation will be established sufficient to keep the grass lands clean and in good heart. Three of the other eight lots ought annually to be cut for hay, and five to be reserved for grazing, out of which last number should be annually taken the lot to be manured, so that none will sustain above five years grazing before it is recruited. The five lots devoted to that service ought to be grazed in succession, both to alleviate the impoverishment it produces, and to increase the produce of grass. Hence he who aims at agricultural perfection, or elegance, will divide these ten lots by ditches, and live hedges of holly or cedar, (the former a conjectural, the latter a tried plant) or at least by the usual fences. Even ditches alone would be of some use. But in the infancy of improvement, attendants of old men, women, or children, are a tolerable resource, producing also the good effect of habituating the last in early life to employment, and advancing their health, with the precaution of folding the cattle in bad weather. This temporary resource is, however, greatly inferior to inclosures, particularly to the living or imperishable. Under this system, product, instead of labour, will soon be computed in reference to space; and bad agriculture, being detected by the miserable crops this mode of computation will disclose, will shrink gradually out of sight, through shame. The means of raising manure, and the most beneficial employment for teams and manual labour, will soon present themselves in those seasons of the year now lost or trifled away. I speak not from theory when I say, that the farm well managed, according to this system, will, in twenty years at least, return back to its original fertility. I add, as an inference from this fact, that supposing contiguous farms of one thousand acres each, one in the usual state of impoverishment and the other in woods, the former to be thus managed, and the latter in the customary mode, with the same amount of labour; that the proprietor of the first would make far more profit, and find his land at the end of the term of far more value than the proprietor of the latter. If these rival farms were in an equal state of impoverishment, at the commencement of the experiment, I have no doubt but the first would produce three times as much bread stuff in twenty years as its rival, independent of its inferior production, and of its exclusive improvement.

A great annual increase of manure is the soundest test by which a farmer can discover whether he is successfully practising the proposed system or not. On the area from which it was taken, five acres were hardly manured eighteen years ago, and now the resources of the farm alone sometimes reach to one hundred and fifty. It is a bread-stuff farm, and grass is used in strict subserviency to that object, for the purpose of enhancing its profit. If gypsum, marle, a neighbourhood to towns, or any other adventitious mode of enriching land, can be added to the supply of manure on such a farm, the process of improvement, and the gratifications of increasing profit, may be accelerated.

The large area upon which the proposed system is calculated, is no obstacle to its application to any other. Its proportions may be applied to a farm of any size. This scale was adopted for the purpose of awakening the best informed order of farmers to the calls of patriotism and self-interest. Intelligence effects great objects by reflection; ignorance from imitation; and though a prosperous state of agriculture depends much upon small farmers, because they possess by far the greatest portion of the national lands, perhaps also of the national industry, its introduction depends upon the successful example of the large ones, who have time, capital and talents adequate to the cultivation of a science abounding in difficulties, and requiring no small degree of reflection. The merchants of Scotland, who had retired from trade, began about fifty years ago to assail, by precept and axample, the then execrable system of agriculture habitually practised in that country, and have supplanted by another, which has diffused a rich surface over a great space, previously occupied by a cadaverous degree of sterility. As we neither love our country less, nor confess an inferiority of intellect, an equal share of effort and perseverance by gentlemen farmers, will certainly be crowned with as much success as the efforts and perseverance of these gentlemen merchants, since our auxiliary advantages of soil and climate are greater. They effected their patriotic design, chiefly by the introduction of the artificial grass culture; and when we consider the favourableness of our climate for great spring crops of grass, frequently demonstrated by as heavy crops of clover as we hear or read of, and also its favourableness for converting them into hay, no reason exists for despairing of obtaining the wonderful state of fertility which a country, less favoured by nature, has acquired by the same means.

"I admit that a farmer may make a less crop than usual, the first or second year, after he adopts the recommended system, unless he begins with a due attention to manuring; but I deny that his profit will be less, because his diminution of crop will be more than compensated by the improvement of his land. An average of the first four years will probably produce a crop numerically equal, at least, to his usual crops; but then his profit will be greater, because having raised it from less space, he will have saved much labour for improvement, and his land will be in better heart. Afterwards his crops will numerically increase gradually to an extent I cannot foresee. Should a man calculate by his hopes of life and chance for self gratification, without any regard for contemporaries or posterity, he ought to adhere to the prevalent system of agriculture, if he expects to live two years only; if but four, his determination may admit of some doubt; but if he expects to live longer, it ought to admit of none. Even principles so narrow, will dictate to him an abandonment of the present land killing habits. A calculation which looks forward but two years, cannot possibly procure success for any agricultural system, except one for exhausting the land as soon as possible. All men, who calculate on so short an interest in the product of land, will strive to increase it to the utmost extent, at the expense of the land itself. A proprietor, sure of dying in one or two years, would improve but with little spirit, though his land was to descend to his children, but a possessor for one or two years, likely to lose the land and live, must feel a great lassitude in improving for future profit, which he cannot keep, for future enjoyment. No good system of agriculture can possibly take place under the suggestion of these impulses.

"I admit also that disappointments will happen from feeble and unskilful trials. Complete success will too often be expected from partial attempts. The imagination can magnify the disrupted toe of a statue, into an entire image, and brood over a fragment with self-complacency: and fanaticism can expect wonders from relics transmitted from ignorance; but it is to be hoped that such cases will be rare in this age of intelligence and free inquiry; that the prejudices imbibed from old habits will be exploded, and that the industry and good sense of the Virginians will rapidly improve all suggestions, the tendency of which is to preserve their country from decay, and themselves from indigence.

"An observation is reserved for the conclusion of this essay, to face an opinion, not less erroneous than common; and not less hostile to profit than to improvement. It is too often imagined that a rotation requiring the interposition of artificial grasses between exhausting crops, is slow in its return of profit, and demands an extraordinary capital, to supply for a time the necessities arising from this delay. But from long and attentive observation, I have confidently concluded, that no crop requires less capital than these grasses, or is equally rapid in its returns of profit. The labour which cultivates other crops prepares the ground to receive grass seeds, and they are mingled and sown with grain. Seed is therefore nearly all the extraordinary capital this system needs, when the artificial grasses are grazed, or devoted to the enrichment of the soil: and the expense of converting a portion of them into hay, though not as trivial, is yet inconsiderable. The returns of profit are infinitely more copious and lasting, as well as more rapid, than those made by any other crop. They suddenly yield milk, butter, cheese, meat, wool and leather. Manure, an increase of grain and other crops, and good working animals soon follow. At every rotation, when ploughed in ungrazed, they present to the farmer an improved soil, without causing additional expense, or requiring additional labour. On the contrary, so far as artificial grasses are thus used, they save him more labour in the single article of fencing, than they consume. And finally, the profit of the system becomes so incorporated with the soil, whilst it is also enjoyed by the reaper, as both to last long, and annually to generate profit upon profit, in a ratio outstripping the fecundity of compound interest."

Grass Plots and **Walks**, are chiefly formed by covering spots of ground with turf taken from a fine common or down; as this mode of obtaining verdure is more speedy, and, for durability, far preferable to that of sowing the soil with grass-seeds. But, where the latter method is practised, the seeds ought to be procured from those pastures which abound with fine and clear grass. The soil should be previously dug, and carefully divested of all clods and stones: after which it ought to be covered an inch deep with good mould. The seed is then to be thickly sown, and raked over, to prevent it from being dispersed by the wind. It will, however, be advisable to mix with the seeds a considerable portion of white clover, as this will produce a finer surface, and retain its verdure much longer than any common grass.

The turf intended to be laid in gardens, ought to be selected from such commons as are free from weeds; and, if it is to be transposed to a rich soil, it will be requisite to cover its surface beneath the turf with sand, or an indifferent mould, that the grass may not become too rank. It will also be necessary to dress the turf late in autumn every second year, either with ashes, or tan, so that the rains may precipitate the ameliorating particles into the ground. The grass, when a few inches high, should be mowed closely, or grazed off by sheep, to prevent it from vegetating too luxuriantly; by which means it will retain its beauty for many seasons; but, if neglected, it will in a few years be overgrown with weeds.

GRASS-HOPPERS, or *Tettigoniæ*, L. are a family of insects belonging to the genus of *Gryllus*, and comprising 69 species: they all leap by the help of their hind legs, which are strong and much longer than the fore-legs. Though their walk is heavy, they fly occasionally with great speed: the females deposit several hundred eggs in clusters under ground, by means of two *laminæ* or plates appended to their tail, with which they penetrate the surface. The larvæ that arise from them, resemble nearly the perfect insects, but are of a smaller size, and apparently destitute of wings: these, however, are enveloped in four excrescences or knobs, which are unfolded when the insect attains its full growth, after having four times changed its coat during the summer.

Grasshoppers do not abound in Britain, and indeed are seldom seen in any considerable numbers, on account of its variable climate. But, in the warmer countries of Asia, Africa, and Europe, especially in Spain, they commit incalculable damage, by destroying the whole vegetation of a corn field, in a short period of time. The only method of extirpating these predatory vermin, hitherto known, is to destroy their eggs wherever they can be discovered in the ground, either in early spring or late autumn; for, as they multiply rapidly, the extermination of the winged insects alone would not be attended with the desired effect. For this purpose, ditches two or three feet deep, may be formed in autumn, filled with horse-dung, to which they are extremely partial, and the surface covered with a few inches of mould. In the following spring, numerous families of grass-hoppers, with their eggs, will be found assembled in these ditches, where they may be readily destroyed. See also Locust.

GRATES, for Fires, are composed of ribs of iron, placed at small distances from each other, so that the air may pass through the fuel, and the accumulation of ashes be, as much as possible, prevented.

Grates are peculiarly adapted to the use of pit-coal, which requires a greater draught of air to promote its burning freely, than any other kind of fuel.

GRAVEL, in medicine, is a disorder affecting chiefly the bladder and ureters; it is occasioned by gritty concretions which collect in those parts, produces considerable pain, and at length obstructs the due secretion and excretion of the urine.

Although the gravel is generally considered as the forerunner of the *calculus*, or stone, yet those patients who are afflicted with the former, are generally exempt from the dangers of the latter

Persons of a gouty or rheumatic habit, as well as the aged, often discharge a white-reddish gravel, which not only obstructs and suppresses the emission of urine, but by its stimulus occasions colic, vomiting, and other spasms. There is a peculiar bodily disposition required for the generation of this painful disease; but it is also remarkably promoted by the use of sour wines; hard food, or such as is with difficulty digested, especially *cheese*; a sedentary life, &c. For the cure of the gravel, only the mildest Diuretics (which see) ought to be resorted to; perspiration should be supported by gentle means, particularly by friction with warm flannel; moderate exercise is never to be neglected; and the patient's diet, as well as his mode of living in general, must be regulated by temperance, and abstinence from all heating food and drink, [and from all acids. The remedies for brick-coloured sediment, are Castile soap half an ounce per day; soda water repeatedly, and magnesia in Seltzer water. For white gravel take the mineral acids.—T. C.]

GRAVELLING, a disorder incident to horses much employed in travelling. It is occasioned by small particles of gravel penetrating between the hoof and shoe, in consequence of which the part swells and festers.

The most efficacious remedy, we understand, is to remove the shoe as early as possible; to *draw* the place to the quick; to express the matter and blood gathered there, and to pick out all the gravel. The wounded foot is next to be washed with copperas-water; then to be filled up with a mixture of hot grease and turpentine; the hole stopped with the refuse of flax or hemp, and the shoe properly set on again. Meanwhile, the animal should not be suffered to work or travel, and the foot must be kept dry: thus, it is asserted, it will heal after two or three dressings.

GRAVELLY LANDS or Soils, are such as abound with gravel or sand, which easily admit both heat and moisture. They receive but little benefit from the latter, if there be a loose bed at the bottom, because it easily evaporates; but if the stratum be firm, for instance, clay or stone, the moisture is too long retained, so as to chill the soil and render it unfruitful. The best method of counteracting this inconvenience, is to manure such land with chalk, which is slightly to be ploughed in, that it may not sink too deep into the ground.

As gravel constitutes the chief material of our roads, and thus becomes an article of considerable importance, we shall briefly mention a method, by which gravel or stone may be discovered *without boring*. It simply consists in observing whether the common White Saxifrage, or *Saxifraga granulata*, L. grows on any spot where a bed of gravel is suspected to lie: for, if that plant be discovered, it will serve as a guide to surveyors or others, where to dig with a certainty of finding the object of their search. We state this fact on the authority of Mr. T. Walford, in the 25th vol. of *Annals of Agriculture*, where an accurate representation of the Saxifrage is given. For a method of clearing land from stone or gravel, we refer the reader to the article Stone. [For gravelly land, *sainfoin* is the proper grass.—T. C.]

GREASE, a disorder in the heels of horses, proceeding either from a relaxation of the vessels, or a vitiated state of the blood and humours.

When a horse's heels are first observed to swell in the stable, and to subside on taking exercise, care must be taken to wash them very clean, after every journey, with soap-suds, urine, or a mixture of vinegar and water. Thus, with proper rubbing, the disease will often be effectually prevented, or removed.

But, if cracks or scratches are perceptible, which suppurate, the hair should be carefully clipped away, as well to prevent a gathering, as to admit of cleansing the animal's heels from all impurities, which would tend considerably to aggravate the disorder. [Then dress with the common green ointment of the shops, that is, yellow basilicon with a little verdigris well rubbed up with it.—T. C.]

When the distemper is only local, and requires no internal medicines, the method above described is generally successful; but if the horse be full and gross, his legs much gorged, so that the hair stares up, and is, as farriers term it, *pen-feathered*, discharging a fetid matter from deep foul sores, in such case it will be advisable to apply to a skilful veterinary surgeon; as the disorder is then become of a dangerous tendency.

Grease, the fat of animals, or any unctuous matter. See Fat, and Tallow.

[Grease spots are best removed by covering the spot with blotting paper and holding over it a hot iron. Then apply warm spirits of turpentine.

Carriage-grease. A mixture of tar with fat, procured by boiling bones. It is better made by adding to a gallon of tar, 1 lb. of tallow, and one quart of whale oil.

The anti-attrition paste, is made two ways: either by mixing oil and tallow with powder of black lead, (plumbago: lead ore, or galena, will not do,) or with finely ground and sifted manganese.—T. C.]

GREEN, is one of the primary colours, exhibited by the refraction of the rays of light. See COLOUR.

Sap-Green is a simple colour, but far inferior to verdigris: it is prepared from the juice of buckthorn berries, evaporated to the consistence of a gum: but it frequently inclines to a yellowish colour.

Another green sometimes used is called *terra verte*, which is a native earth, probably impregnated with copper. [The blue precipitates from muriate and nitrate of copper by means of potash, are said to turn green when ground with oil.

Scheele's Green. Add a solution of arseniate of potash to a solution of blue sulphate of copper till no more precipitate falls. Sulphate of copper precipitated by caustic potash is blue, but it is said to become green by mixing it with oil and exposing it to the air.—T. C.]

The following method of preparing *Brunswick Green*, a beautiful colour, in great request in Europe for oil-painting, and in the manufacture of stained paper, is inserted on the authority of M. KASTELEYN. He directs shavings of copper to be put into a close vessel, and sprinkled with a solution of sal ammoniac. The metal first unites with the muriatic acid, and is dissolved, when it is precipitated by the disengaged ammonia, with which it combines. The precipitate is then to be washed, and dried either in wooden boxes, or upon an expanded cloth: the liquid now remaining may be repeatedly employed as a solvent for fresh portions of sal ammoniac, till it be completely saturated. M. KASTELEYN states, that three parts of such salt are sufficient for two parts of copper, and that the result will be six parts of colour.—This beautiful pigment is sold in Holland by the name of *Friesland Green;* and it sometimes forms an article of exportation; in which case it is generally adulterated with white lead.

To paint a good green, the first coat must be a lead colour.

GREEN-FINCH, a species of the *Fringilla*, L. a charming little bird, which has a strong tinge of green diffused over its whole body; the wings and tail are black, but variegated with yellow.

The green-finch may be easily domesticated, by carrying it into a dark place, putting it upon one finger and gently touching its breast with a finger of the other hand. Thus, by a few caresses, and gradually admitting daylight, this little creature may be accustomed to eat any bruised seed out of the hand, and will then continue tame.

GREEN-HOUSE, a conservatory or erection in gardens, for the purpose of sheltering the more curious and tender exotics from the effects of our variable climate, especially during the winter season.

The length of green-houses ought to be proportioned to the number of plants intended to be kept, or raised. Their depth in small houses should not exceed twelve or fourteen, and in large ones, eighteen or twenty feet. The windows should reach from about 1½ foot above the pavement to nearly the same distance from the ceiling, so as to admit of a cornice being constructed round the buildings, over the tops of the windows. The breadth in the smaller conservatories ought not to be more than 5 or 5½, and in the larger ones 7 or 7½ feet; as they will otherwise become heavy and inconvenient.

The floor ought to be paved with brick, stone, or flat tiles, elevated two, or if the situation be damp, three feet above the surface of the ground; it will also be advisable to carry a flue, about ten inches wide, and two feet deep, beneath the floor, through the whole length of the house, and to return it along the back part, where it should be carried up into funnels, for the purpose of discharging the smoke. In the inside, shutters should be made so as to fold back upon the piers, that the rays of the sun be not impeded. The inner wall of the building ought to be either covered with stucco, or plastered with mortar, in order to exclude the frosty air. But, if the walls be wainscoted, it will be requisite to plaster the intermediate space with lime and hair: the ceiling and walls or wainscot, ought, however, to be white washed, so that the rays of the sun may be reflected throughout the building.

While the front of the conservatory is placed directly south, the two wings should be respectively arranged to face the south-east and south-west. Thus, the warmth of the sun will be reflected from one part of the green-house to the other, during the whole of the day; and the front will be effectually guarded against the cold northerly winds.

In the 2d vol. of "*Recreations in Agriculture*," Dr. ANDERSON proposes to construct a green-house, in such a manner that it may be converted into a hot-house, without requiring any additional fuel. He therefore recommends the roof to be made of glass, placed in a sloping direction; and to fix perpendicular windows on the top of the front wall, so as to raise the lower eaves of such roof considerably higher than that of the slates would have been, without elevating the middle of the roof. According to his plan, the triangular, perpendicular wall should be completely covered with glass, through which the morning and evening sun may be admitted. In the country, or in houses unconnected with others, he suggests the propriety of bringing perpendicular windows closely down to the floor, both on the east and west ends, in order to receive the benefit of the rising and setting sun.

With respect to the conversion of this structure into a *stove*, or *hot-house*, Dr. ANDERSON supposes it to be erected close to the kitchen chimney of an inhabited house. At a small distance from the bottom of the chimney, there is to be made a communication with a flue or stove, which passes beneath, and rises on the opposite side of the green-house, where an appropriate tile is suspended from a lever which, by means of a cord fastened to its extremity, may at pleasure drop this cover on the top of the tube or flue, and thus prevent the smoke from ascending; the bottom of the cover being lined with pieces of thick cloth, so that it may apply closely and become air-tight. A valve is likewise placed in the chimney, which turns on a pivot, so as either to allow the smoke a free passage, or to impel it into the flue, whence, after parting with its heat, it is either suffered to escape at the top, or is reverberated, according as the covering tile before alluded to, is shut or opened.

For a more ample account of this project, we refer the reader to the 2d vol. of Dr. ANDERSON's instructive work above cited, where it is illustrated by cuts. We have here given an outline of his plan, because it is ingenious, and may lead to farther improvements.

With respect to the management of plants in green-houses, MORTIMER recommends occasionally to open the mould in which they are set, to scatter a little fresh earth on the pots, and over this to lay a little dung. It will also be advisable to water them, when the leaves begin to curl or wither; and to pluck off such as are decayed; but these operations should not be too frequently repeated. See HOT-HOUSE.

Plants destined for the green-house, should be kept out as late in the autumn as safety will admit, in order to prepare them for the diminished temperature to which they will be exposed. A slight white frost will not injure, but benefit all except *very tender* plants. During the day they ought to be placed in the shade for a week, in order that they may not suffer by different degrees of temperature in the day and night; and that they may be accommodated gradually to the cold, which they are destined to bear, before being confined for the winter.

The sun must be kept out until the depth of winter. In the evening, water the floor, in order that the air may be filled with moisture, by which plants thrive more, than when the water is applied to their roots.

Orange, lemon and lime trees, must not be permitted to blossom in the green house during winter, as they will thereby be prevented from bearing the following season. They must only be kept alive and healthy, to prepare them for the genial warmth of the external atmosphere in the spring. The leaves are much disposed to fall off, if the tree has been subjected to too much warmth during the winter. The evergreen plants never push out leaves in the same place a second time. Water constantly evaporated from a stove, is highly useful.

J. W. WATKINS, Esq. of New-York, gives the following plan for the construction of a green-house, in the *Trans. of the Agric. Soc.* of the above state.

The building should be sunk in the earth from two to four feet, in proportion to the size of the house, and according to the nature of the soil; as clay retains moisture, and of consequence produces damps, in such ground it should not be so deep. The height should not exceed twelve feet from the exterior ground, by which it will be less exposed to high winds. The width should not exceed sixteen or eighteen feet, as the sun's rays are at that distance from the glass very feeble. A south front is well known to be the true one, but advantage should be taken of glazing as much of the eastern end as possible, for the benefit of the morning sun. The front should decline northward from a perpendicular with the horizon, so as the angle made thereby with the horizon, will at noon day in winter, bring the rays of the sun to strike the glass at right angles, and the roof should descend the opposite side without a break. By this position of the roof and glass, the rays of the sun are thrown upon every part of the inside of the house, and the whole becomes heated thereby; more of the rays are also introduced into the building, and when the sun produces most heat during the day, there is no reflection of its rays, and at other parts of the day, the reflecting angle being obtuse, does not powerfully cast off the rays. The inside of the rafters of the roof, should be lined with boards, and the space between that and the roof filled with a mixture of straw, sand, and clay made into mortar; boards should be used in preference to shingles, as making fewer breaks in the roof, less opportunity is given for the admission of cold air. The residue of the building may be of stone or brick work, or a frame building filled in with bricks, and no flooring of any kind upon the ground. Shutters on the outside are sufficient, and it is preferable to have them hung on hinges, as the least troublesome, to the common practice of sliding ones; they should be made to fold into the spaces between the windows.

Before putting the plants into the house, the bottom should be covered with bark from a tan-vat, about a foot deep, according to the depth the building is sunk in the earth.

The advantages proposed by this method of constructing are, the lessening the expense of building, that the heat of the sun being sufficient to warm the house, the trouble and expense of warming it by a stove is avoided, which unless very carefully attended, the plants may be injured by too much heat, and are always by the smoke that unavoidably makes its way out of the pipes. It would be proper, nevertheless, to make arrangements in constructing the house for using a stove, in case a long succession of cold cloudy days, by obscuring the sun, should reduce the heat in the house below that degree of temperature necessary for preserving the plants, which is a case that will seldom happen, as one clear day will warm the house sufficiently to admit its being shut up for several days.

Plants in a house of this kind require less water, and do not suffer for the want of atmospheric air. It is probable, as the earth is charged with electric fluids, as vegetable substances are known conductors of it, that the bark, by its fermentation, not only generates heat, but serves as a mean to produce out of the earth, an atmosphere for the plants, sufficient with such atmospheric air as will find admission, to supply the quantity exhausted, by the daily rarefaction occasioned by the sun's heat.

A green-house has been used upon this construction in this state, without having had the least occasion of being heated by fire. The plants in the spring were remarkably thrifty; tropical fruit ripened in it during the winter, and young fruit formed on the trees. It required no other care, than now and then watering the plants, and shutting the windows as soon as the sun left them.

GREEN-SICKNESS. See *Chlorosis.*

GREGORIAN YEAR, in chronology, a correction of the Julian year. In the latter, every secular or hundredth year is bissextile: in the former every one in four. This reformation, which was made by pope GREGORY XIII. A. D. 1582, is also called the *New Style.*

GREY-HOUND, the COMMON, or *Canis Graius*, L. is a dog remarkable for his swiftness, strength, and sagacity, in pursuing game. There are several varieties, such as the Italian, the Oriental, and the Highland Greyhound: the last of which is now become exceedingly scarce.

A good grey-hound ought to have a long, and rather large body; a neat pointed head, sparkling eyes, a long mouth, with sharp teeth, small ears, formed of a thin cartilage; a broad, and strong breast; his fore-legs straight and short; his hind-legs long and limber; broad shoulders, round ribs, muscular buttocks, but not fat, and a long tail, strong and full of sinews.

In the breeding of these animals, the female is principally to be regarded; though both should, as nearly as possible, be of the same age, which ought not to exceed four years.

GRIEF, or an increased and continued degree of sorrow, is one of the depressing passions. Its influence on the body is remarkable; and its effects, with few exceptions, are similar to those of *fear.*

Grief diminishes bodily strength in general, and the action of the part in particular. The circulation of the fluids is thus impeded; the bile stagnates, and occasions indurations of the liver; or, by mixing with the blood, it produces either jaundice or dropsy. Grief also diminishes perspiration, renders the skin sallow, aggravates the scurvy.

but particularly putrid fevers, and disposes persons to become easily infected with them. Its effects in changing the colour of the hair, are well known, and instances have occurred, in which the hair has been turned from a deep black to a grey colour, in 24 hours. Blindness, gangrene, and even sudden death, or, as it is emphatically called, a *broken heart*, have resulted from the excess of this passion. Persons who indulge in *fretting*, become at length in a high degree peevish and irritable: from the constant return of sorrow, the mind beholds new food for it in every object.

GRIPES, or Colic, in Farriery, a disorder with which horses are frequently affected. As it arises from various causes, its treatment must necessarily differ; and as the most judicious farriers have divided this malady into three species, we have adopted such division, because there is no distemper incident to that useful animal, which is more frequently mismanaged by ignorant pretenders, and consequently becomes incurable.

1. The first species is the *flatulent* colic, which is generally occasioned by wind in the bowels, after drinking cold water, when the horse is hot; or the perspirable matter is retained, and repelled on the bowels, by catching cold: in either case, those parts become violently distended. This species of the disease may be distinguished by the rumbling of confined air in the intestines, and the restlessness of the animal affected, which often lies down, and rises almost instantly with a violent spring; striking his belly with his hinder feet, stamping with those before, and refusing his food. The horse is frequently attacked with a kind of convulsions, and falls into profuse sweats, which are quickly succeeded by cold damps. He strives repeatedly to stale, turning his head to his flanks, rolling on the ground, and frequently lying on his back. The symptom last mentioned arises from a retention of urine, which generally attends the flatulent colic, and is often increased by an accumulation of dung pressing on the neck of the bladder. The first remedy is, to introduce into the straight gut, a small hand dipped in oil, by which the confined air obtains a passage; and the neck of the bladder being thus relieved, the suppression of urine will be removed. Next, the following preparation will be of considerable service: Take half an ounce of Venice turpentine, and a similar quantity of juniper-berries pounded; one ounce of salt-petre, one drachm of oil of juniper, and two drachms of salt of tartar. Let these ingredients be formed into a ball with syrup, and given to the animal affected; after which it may be washed down with a decoction of juniper-berries, or with a little ale. But, if the horse neither break wind, nor stale plentifully, it will be requisite to repeat the ball at the expiration of two hours, with the addition of one drachm of salt of amber. He should likewise be gently exercised during the continuance of the fit. A clyster may be given either during the interval of taking the balls, or alone, and occasionally repeated: for this purpose farriers use the following ingredients, viz. Two handfuls of chamomile flowers, an ounce of anise-seeds, and a similar quantity of fennel and coriander seeds: these are to be boiled in three quarts of water, till they are reduced to two; when half a pint of gin should be added, together with half an ounce of oil of amber, and eight ounces of oil of chamomile. We conceive, however, that instead of the last three expensive articles, a pint of common, or linseed oil, will answer a similar purpose. By a judicious application of these remedies, the animal will be considerably relieved; and, if his restlessness cease, and he continue quiet for an hour or longer, no danger need be apprehended.

2. The *bilious* or *inflammatory* gripes, are attended with the same symptoms as the flatulent colic, together with a considerable degree of fever, panting, and dryness of the mouth. The horse frequently discharges a small quantity of dung, together with a hot scalding water. If the urine appear of a blackish, or reddish colour, accompanied with a fetid smell, a mortification will speedily ensue. To counteract these dangerous symptoms, the distempered animal should immediately lose three quarts of blood; which operation ought to be repeated, unless a favourable change take place within three hours. The clyster above-mentioned, should be injected thrice a day, with the addition of two ounces of nitre dissolved in water: large draughts of gum-water should be allowed, and a pint of the following drink administered every three hours, till several loose stools are procured; when it may be repeated every night and morning, till the disorder be removed: Let three ounces of senna, and half an ounce of salt of tar-

tar be infused in two quarts of boiling water, for one or two hours: when the liquor should be strained, adding two ounces of the common lenitive electuary, and four ounces of Glauber's salt. If, notwithstanding these remedies, the inflammatory symptoms become more violent, the event will in general be fatal. A strong decoction of Peruvian bark is the only medicine that may probably afford relief; a pint of which ought to be given every three hours, with half a pint of port-wine.

3. The *dry gripes* arise chiefly from costiveness; they are known by the animal's restlessness, and frequent but unsuccessful attempts to dung. In this case, the straight gut should be relieved in the manner above directed for the flatulent colic; an emollient clyster, consisting of two or three quarts of thin water gruel, six ounces of sugar, and an equal quantity of salad-oil, should be injected lukewarm, three times in the course of twenty-four hours; and the purging drink, prescribed for the inflammatory gripes, may be given till the bowels be unloaded, and the symptoms abate.

The proper diet for horses attacked with either species of this painful disorder ought to be scalded bran, thin water-gruel, or what is called by farriers *white water;* which is prepared by dissolving four ounces of gum arabic in two quarts of water, and mixing the whole with the animal's usual drink.

GRITSTONE, or Sandstone, is formed of agglutinated particles of sand. It is opaque, and in large masses of various degrees of hardness: but always much softer than either quartz or flint. When broken the surface appears granulated.

Sandstones are found in many parts of England, and are of great utility for the formation of such buildings as are designed to resist the combined effects of air, fire, and water. Some of them are soft while in the quarry, but become hard on exposure to the air. The harder and more compact kinds will even admit of being polished. Sandstones have of late years become an article of traffic in Derbyshire and other parts of England for the filtering of water. They are brought from the vicinity of Newcastle for grindstones and whetstones, for sharpening scythes, rubbing down copper-plates, and various other purposes

GROTTO, a large deep cavern in a mountain or rock. Among the natural grottos of Great Britain, are Okey-hole, Elden-hound, Peake's hole, and Pool's hole. Okey-hole, on the south side of Mendip-hills, is in the fall of those hills, which is beset about with rocks, and has near it a precipitate descent of near twelve fathoms deep, at the bottom of which there continually issues from the rocks a considerable current of water. This cavern is about 200 yards in length, and at the farthest part of it there is a good stream of water, large enough to drive a mill. At certain seasons there are in it multitudes of frogs and bats. Elden-hole is a huge profound perpendicular chasm, three miles from Buxton, ranked among the natural wonders of the Peak. Its depth is unknown. Peak's hole, and Pool's hole, are two remarkable horizontal cavities under mountains, the one near Castleton, the other just by Buxton. They seem to have had their origin from the springs, which have their current through them. The Grotto del Cani is a little cavern four leagues from Naples, the air contained in it is chiefly carbonic-acid gas, which, by its weight, is found near the bottom of the cavern, so that a man may pass through it with safety, but to a dog, cat, &c. it will be fatal.

GROUND-IVY, Gill, or Ale-hoof, *Glechoma Hederacea*, L. an indigenous plant, thriving in groves, hedges, and shady places; flowering in the months of April and May.

Ground-ivy has a peculiar strong odour; it is of a bitter and slightly aromatic taste. Its leaves contain an essential oil, destitute of smell. This plant was formerly held in great estimation, and supposed to possess eminent medicinal virtues; but which are not confirmed by later experience.

GROUND-NUTS, or Ground-pease, the *Arrachis Hypogaios Americanus* of Ray, a plant cultivated in the West-Indies by the Negroes. When in flower, it inclines towards the earth, into which the pointal enters, and extends to a certain depth, where the seed-vessel and fruit are formed; so that the latter attains to maturity under ground. As large crops of this vegetable are produced on light sandy lands, of little value, it may be advantageously cultivated in such soils.

The seeds or fruit, when bruised and expressed through canvas bags, afford a pure, clear, and savoury oil, which will admit of being kept for a considerable time, without becoming rancid, or requiring any particular care, even during the heat of summer. As one bushel of the seeds, when expressed, yields a gallon of pure oil without, and a much larger quantity, though of inferior quality, with the aid of heat, they deserve to be more generally known and imported.

GROUND-PINE, or *Ajuga Chamoepitys*, L. an indigenous plant growing in sandy fallows, and flowering in the months of April and June. It possesses a bitter and acrimonious taste, and though it has often been recommended as a medicine for the cure of the gout, jaundice, and intermitting fevers, yet its real efficacy in these diseases is not ascertained.

GROUNDSEL, the Common, or *Senecio vulgaris*, L. an indigenous plant, growing on cultivated grounds, rubbish, and in court-yards; it flowers from April to September. Its seeds are very agreeable to gold-finches and linnets confined in cages. Cows do not relish this plant: it is, however, eaten by goats and swine, but refused by horses and sheep.

There is another useful species of the groundsel, the *Senecio Jacoboea*; for which we refer to Ragwort.

GROUSE, or Growse, a bird which is found in woody and mountainous situations.

The Red Grous, or Red Game, (*Tetrao scoticus*) is a species of feathered game from fifteen to nineteen ounces in weight, which has its plumage beautifully mottled with deep red and black, and the six outer tail feathers blackish.

Over each eye is an arched and naked scarlet spot, and the feet are feathered to the claws.

This bird inhabits the mountainous heaths of Derbyshire, Yorkshire, Wales, and Scotland.

It is generally supposed that red grous are peculiar to the British islands. They are found in "packs," consisting sometimes of forty or fifty birds; and are an object of easy pursuit by sportsmen. They principally frequent high and heathy grounds, and seldom descend into the valleys. They are eaten roasted, like most other game, but are sometimes potted, and are in general much admired for the table.

Red grous have been bred, and successfully reared in confinement, by supplying them almost every day with fresh pots of heath.

Black Grous, or Black Game, (*Tetrao tetrix*,) is a species of feathered game of violet black colour, with the tail forked, and the secondary quill feathers white towards the base.

Its weight is from two to four pounds. These birds are found in mountainous and woody parts of the north of England, and in the New Forest, Hampshire; in Scotland and several countries of the continent of Europe.

The pursuit of this and other species of grous is an important occupation in the northern parts of the continent of Europe. In some parts of Russia they are caught in traps of wicker-work baited with corn. Huts full of loop-holes are sometimes formed in the woods that are frequented by them, and upon the adjacent trees artificial decoy-birds are placed. The persons in the huts fire upon the grous as they alight, being careful to kill those first which are upon the lower branches; and, in this case, so long as the men are concealed the report of the guns does not alarm the birds.

These birds feed on mountain fruits, and in winter on the tops of heath; and, although they always roost on trees, they form their nests on the ground. Each female lays six or eight eggs, of dull yellowish white colour, marked with numerous small rust-coloured specks, and towards the smaller end with some blotches of the same colour. The young male birds quit their parents in the beginning of winter, and usually associate in small packs until the spring. The black grous will live and thrive, but have not been known to breed in aviaries.

The Ptarmigan, or White Game, (*Tetrao lagopus*,) is a species of grous which in summer is of pale brown colour, elegantly mottled with small bars and dusky spots; and has the bill and the tail feathers black. In winter it is almost wholly white.

These birds, which are somewhat larger than a pigeon, are inhabitants of all the extreme northern countries of the continents both of Europe and America. They are also found amongst the mountains of Scotland, and are sometimes seen in the Alpine parts of Westmoreland and Cumberland.

By the inhabitants of Greenland the *flesh* and even the intestines of these birds are much esteemed as food. The *skins* with the feathers on are made into clothing; and the black *tail-feathers* were formerly much in request among this people for female head-dresses.

So numerous are these birds in the northern parts of America, as at the commencement of winter to assemble in flocks of 150 or 200 in number; and more than 10,000 have in some years been caught near Hudson's Bay, betwixt the months of November and May. They are killed in various ways; by snares, with nets, and with guns; and indeed so fearless are they of the approach of mankind that they may be knocked down with sticks or clubs. Instances have occurred of their having been driven almost like poultry into nets or snares that have been laid for them.

In Great Britain these birds associate in small packs, and live amongst rocks, perching on the stones, and when alarmed taking shelter beneath them. They feed on the mountain berries, the buds of trees, and the young shoots of the heath. The females form their nests on the ground, and lay in them from six to ten eggs, which are of a dusky colour with reddish brown spots.

It is a very extraordinary ordination of Providence, that these birds at the commencement of winter should assume a white plumage, by which, being incapable of defence, they are able amidst the winters' snows to elude the pursuit of their enemies. And not only this, but as an additional protection against the cold, all the feathers except those of the wings and tail are now doubled.

As food, these birds are said very much to resemble the red grous in flavour.

The WOOD GROUS, or CAPERCAILE, (*Tetrao urogallus*) is a bird nearly as large as a turkey, its plumage varied, but bay above marked with blackish lines; the tail rounded, and the under parts at the base of the wings white.

This bird is found in the northern parts of Europe and Asia; and (though very rarely) in the Highlands of Scotland north of Inverness.

There can be no doubt but in ancient times these birds were common in the mountainous parts of South Britain. In countries where pine forests are numerous they feed on the buds of the fir trees, and on the young cones, so as sometimes to render the taste of their flesh extremely unpalatable. They are also partial to the berries of the juniper.

The females form their nests on the ground, and lay from eight to sixteen eggs, which are of a white colour spotted with yellow.

GRUB, in ZOOLOGY, the English name for worms, or maggots, hatched from the eggs of beetles.

Grubs are an excellent bait for many kinds of fish. In angling for the grayling (See UMBER) as well as trout, the *ash-grub* is preferable to all others. This insect is of a milk-white colour, a plump round form, with a red head. There is another very common grub, which is longer and thinner than the ash-grub; has also a red head, but two rows of legs along the belly; it is tougher and yellower. To preserve grubs, they should be kept in bran, which will render them very firm; but the ash-grub is always so tender, that it can with difficulty be employed as a bait: hence, it should be wrapped in a piece of stiff hair with the arming, and about a straw's breadth left to project at the head of the hook, to prevent the grub from sliding off, when baited. The horse-hair must be white, or of a colour perfectly resembling that of the bait; as otherwise it will be suspected by the fish. For the different methods of destroying grubs, in general, see CHAFFER.

GRYLLUS, the locust, grasshopper and cricket, in natural history, a genus of insects belonging to the order hemiptera. There are sixty-one species, of which the most numerous is the gryllus migratorius, or common locust, which of all insects is most capable of injuring mankind. Legions of these animals are from time to time observed in various parts of the world, where the havoc they commit is almost incredible: whole provinces have been desolated by them in the space of a few days, and the air is darkened by their numbers; when they are dead, they are still terrible from the putrefaction arising from their vast numbers. This was the case in the year 852, when immense swarms took their flight from the eastern regions into the west: they destroyed in their course all vegetables, and the corn, at the rate of 140 acres per day: their daily marches or distances of flight were computed at 20 miles, and these were regulated by leaders or kings, who flew first and settled on the spot which was visited at the same hour the next day by the whole legion; these marches were always undertaken at sun-rise. The locusts were at length driven, by the force of the winds, into the German Ocean, and being thrown back by the tide and left on the shores, caused a dreadful pestilence by the stench which they made by their dead bodies.

GUAIACUM, or *Lignum vitæ*, L. is a genus of plants producing three species, the principal of which is the *officinale*, or Common Lignum Vitæ, a native of the West Indies. It may, in colder climates, be propagated by seeds sown in pots plunged into a hot-bed, but it is seldom cultivated in this country.

The wood of this species is of equal utility in the mechanical arts, and in medicine; being so heavy as to sink when immersed in water. It is chiefly employed in the West-Indies for the wheels and cogs of sugar-mills, and is also frequently formed into mortars, bowls, and other utensils.

The wood, gum, and bark, are all employed in medicine, though the two first are chiefly used in Europe.

Gum Guaiacum is of a friable nature, of a deep greenish colour, but sometimes of a reddish hue; and has a pungent acrid taste. There is another spontaneous exudation obtained from the bark of this tree, which is called *native gum*: it is imported in small irregular, semi-pellucid pieces; and is much purer than that extracted by incision.

The general virtues of Guaiacum are those of a warm aromatic medicine: it strengthens the stomach and other viscera, and greatly promotes the discharges of urine and perspiration. Hence it is of especial service in cutaneous eruptions, and disorders arising from obstructions of the excretory glands: in rheumatic and other pains, unattended with fever, the liberal use of gum guaiacum has often afforded considerable relief. It is likewise a good laxative, and furnishes a more active medicine than either the wood or bark of this tree.

Gum Guaiacum, when dissolved in rum, or combined with water, by means of mucilage or the yolk of an egg, or in the form of a tincture or elixir, has been found useful in chronic rheumatism, or even in such wandering pains of the stomach or other parts of the body, as could be attributed to the retrocedent gout; in which cases a small table-spoonful of the emulsion may be taken three or four times a day.

GUAVA, or BAY PLUM, is a West Indian fruit, of which there are two kinds, one white and round, and the other red and pear-shaped. The former is produced by a tree (*Psidium pomiferum*) which has sharp-pointed and highly ribbed leaves, and flowers three on each stalk; and the latter by a tree (*Psidium pyriferum*) with oval leaves and single-stalked flowers.

Equally delicious and wholesome, these *fruits* are in the highest estimation in the countries where they are produced. The rind or skin is lined with an apple-like substance which is used for tarts and other sweet preparations. It is also stewed and eaten with milk; and in this form, is generally thought better than any other stewed fruit; from the same part a marmalade is made. This rind encloses an agreeable pulp, mixed with innumerable small seeds. The whole fruit is eaten raw, or prepared as a sweetmeat in various ways: the most common form in which we see it is that of a jelly.

The *wood* is used for fuel, and also makes an excellent charcoal.

GUDGEON, in Ichthyology, is a species of the *Barbus*, or BARBEL; which see. It inhabits most running waters, small streams, such as the river Lea, and is found in great abundance in the New River, near London. Though small, this fish is highly esteemed for its fine flavour.

GUELDER-ROSE, or *Viburnum*, L. a genus of plants comprising twenty-two species, two of which are natives of Britain.

1. The *Lantana*, Mealy Guelder-rose, Pliant Mealy Tree, or Wayfaring Tree, which grows in calcareous soils to the height of 18 or 20 feet, in woods and hedges; it produces large white flowers in May, and black farinaceous berries in October. The young branches and rind of the trunk of this species may be employed for bands and cords. It is, however, chiefly esteemed for its beautiful foliage, which renders it an ornament to parks and plantations. The bark of its root is used for the preparation of bird-lime; the berries attract birds, and are of a drying, astringent nature.

2. The *Opulus*, Common Guelder-rose, or Water Elder, which grows in woods and damp hedges; bears white blossoms in May or June, and red berries in September. When in bloom, this tree exhibits a singularly fine appearance; the flowers, though small, are formed into large globular umbels, whence it is sometimes called the *Snow-ball tree*. Birds are enticed by the red berries, but will not eat them. According to BECHSTEIN, these berries may be preserved in vinegar, and the tough, hard wood is employed by shoemakers for small pegs of heels.

GUILANDIA, *Bonduc* or *Nickar tree*. A forest tree abounding in the western states of America. It bears nuts about the size of the pignut, of a deep chocolate colour and shining appearance. The shell is so thick and hard, that they require to be filed, to forward their vegetation. The nuts when parched and ground, are substituted for coffee by the inhabitants of the western country.

GUINEA, a British gold coin, thus denominated, because the precious ore from which the first guineas were coined, was originally imported from the coast of Guinea.

The value or rate of this coin has frequently varied: when first struck, its current price was 20*s*. on account of the scarcity of gold, it afterwards advanced to 21*s*. and 6*d*. but its present *nominal* value is 21*s*.

If the pound weight (troy) of gold be divided into 89 parts, each of them will be equal to half a guinea, so that 12 ounces contain 44½ guineas.

GUINEA-CORN, or *Holcus Sorghum*, L. an exotic vegetable, growing on the coast of Africa: its stalks are large, compact, generally attaining the height of 7 or 8 feet, and producing abundance of grain. It may be easily raised in sheltered situations, especially in exhausted hod-beds and other loose soils, where its seeds should be sown early in the spring; as the large flowery tops appear in June. In Tuscany, Syria, and Palestine the flour made of this grain is mixed with other meal, and converted into bread; which however, is generally brown, tough, and heavy. Hence the former is better calculated for milk-porridge that is equally wholesome and nutritive. The juice exuding from the stalks of the Guinea-corn, is so agreeably luscious, that it affords excellent sugar, by a process similar to that adopted with the sugar-cane. The seeds furnish nourishing food to poultry and pigeons, as well as for horses and hogs.

GUINEA-FOWL, Gallina, or Pintado, (*Numidia meleagris*) is an African bird, which is now domesticated in most parts of Europe, and is known by the red or bluish wattles under the throat, a naked protuberance on the head, their slender neck, and beautifully spotted plumage.

The flesh of Guinea fowls is tender and sweet, and by some persons is thought to resemble that of the pheasant. In Guinea and the adjacent parts of Africa, their native country, where they are not unfrequently seen in flocks of two or three hundred together, they are hunted and caught by dogs. These birds chiefly delight in marshy and morassy places, and subsist on insects, worms, and different kinds of seeds. Their eggs are a very delicate food.

Guinea fowls were originally introduced into England somewhat earlier than the year 1260, and are now common in the poultry yards. The females always endeavour to lay their eggs in some concealed situation; and the chicks when hatched require warmth and quiet, and should for some time be fed with rice swelled with milk, or with bread soaked in milk.

These are restless and clamorous birds, and have a harsh, and to some persons, unpleasant cry, which consists of two notes, sounding like "camac, "camac, camac," frequently repeated.

GUINEA-GRASS, a valuable species of herbage, thus denominated, as it was first discovered on the coast of Guinea, whence it was brought to Jamaica.

In point of real utility, this plant ranks, in Jamaica, next the sugar-cane; for the breeding farms throughout the island were originally established, and are still supported, chiefly by means of the Guinea-grass, which bestows verdure and fertility on lands that would otherwise not deserve to be cultivated. About ten years since, it was also introduced into the East-Indies, where it is now successfully cultivated, and grows to the height of seven feet: it admits of being frequently cut, and makes excellent hay. Cattle eat it, both in a fresh and dry state, with great avidity: hence the culture of this valuable herbage has been strongly recommended to the farmers of Cornwall and Devonshire.

The following remarks on the culture of this grass are by the late H. Lawrence, of South Carolina.

"In the last spring, I procured from Jamaica three half pints of Guinea-grass seed, which I planted in the drills of one-fourth part of an acre of very indifferent land; the seed sprung and soon covered the ground with grass four feet high and upwards. Being desirous of saving as much seed as possible, I cut one bundle of grass for horses: they ate it all with great avidity.

"In August I took one of the grass roots and divided it into twenty-eight parts, which were immediately replanted: every part took root, and the whole are now growing very finely and seeding. I am of opinion this grass will make the best pasture we can wish for. From former experience I have reason to believe the Guinea-grass is perennial. It is easily managed, requires but one good hoeing, after which it will take care of itself.

I am informed a gentleman near Kingston, in Jamaica, makes upwards of 1000*l.* sterling per annum by Guinea-grass hay.]

GUINEA-HEN, or *Numida meleagris*, L. an exotic species of gallinaceous fowl, which is a native of Africa. Its body is sloped in a manner similar to that of a partridge, and its dark grey colour is beautifully variegated with white spots.

Guinea-hens are not so tame and domestic as our native fowls, and frequently occasion considerable trouble to their keepers, by flying into hedges and bushes, especially during the night, where they lay, and hatch their eggs, of which they frequently deposit from 100 to 150. Their flesh is generally white, tender, and sweet, though it is sometimes found perfectly black.

GUINEA-PIG, or, as it is more properly termed, the Restless Cavy, *Cavia Cobaya*, is not a native of Guinea, but of Brasil, whence it has been imported into Europe. It is about seven inches in length, and its white body is variegated with irregular black and orange-coloured spots. The female breeds at two months old, and brings forth ten, twelve, or fourteen young ones, several times in the course of the year, after a gestation of three weeks.

Guinea-pigs feed on all kinds of herbs, but are particularly fond of parsley, as likewise of apples and other fruit. In their wild state, they multiply prodigiously, and would become innumerable, if they were capable of sustaining cold and moisture. Cats are their natural enemies; but their haunts being supposed to be exempt from the inroads of rats, guinea-pigs might be usefully reared in country places infested with those predatory animals; as they afford a palatable and wholesome food. In a domestic state, they are very restless, and make a continued noise, similar to the grunt of a young pig.

GULL, or *Larus*, in ornithology, a genus of aquatic birds, comprising eleven species, the most remarkable of which is the *Parasiticus*, or DUNG-BUNTER: it is about twenty-one inches in length; the upper parts of its body, wings, and tail, are black; the lower part of the breast dusky, &c. It commonly frequents the Hebrides in the month of May, and retires about August. It is also found in the Orkney Islands, and on the coasts of Yorkshire, where it is called the *feaser*. The female constructs her nest of grass and moss, on a hillock, in some marshy situation, in which she deposits two ash-coloured eggs, spotted with black, and about the size of those of a hen. FUNKE, a German naturalist, informs us that these eggs are found in such numbers, on an island which is uninhabited, in the vicinity of Amsterdam, that it is let at the annual rent of 20,000 florins.

Gulls, in general, fly but slowly; though, when in pursuit of other birds, they often attack and compel them to disgorge the fish, or other food, which the gulls devour with avidity.

GULLET, or *Œsophagus*, in anatomy, is a long, round, and capacious tube, destined to convey the food from the mouth into the stomach. It descends between the windpipe and the joints of the neck and back, as far as the fifth joint of the spine, where it turns somewhat to the right till it arrives at the ninth; where it again changes its direction towards the left, climbs over the *aorta*, or the largest blood-vessel in the human body; and, after rising above it, penetrates the midriff, and then extends to the left orifice of the stomach.

Instead of enlarging upon the situation and structure of the gullet, we shall give a few directions for removing *substances stopt between the mouth and the stomach.*

If the matter detained within the gullet, is of an alimentary or harmless nature, it may then safely be pushed down by means of a heated and oiled wax candle, to render it flexible; because the manner in which the obstruction is formed, may often occasion death.

On the contrary, if the substances swallowed are indigestible, such as pins, needles, pieces of bone, glass, buckles, or other pointed bodies, immediate attempts should be made to extract them: when they have not descended too low, the fingers will frequently be sufficient to reach and withdraw them, but if they be deeper within the gullet, other means must be instantly adopted; as delay may prove fatal. For this purpose, the most simple instrument is a crotchet, or a kind of hook, made of smooth and thin iron wire, by bending it into an oblong ring at one end, reflecting the wire to the top, and forming a large handle: thus, no pointed part will injure the throat by introducing the hook; and there will be no danger of its slipping from the operator's hand. We have seen a more effectual instrument contrived by a double and triple ring of thin wires crossing each other in an oval form, so as to leave spaces between them, in order to loosen and extract a pin, or other sharp substance: the handle must, in either case, be somewhat bent, and accommodated to the curve of the neck.

As, however, the construction of such a crotchet requires some ingenuity; and as wires may not always be at hand, there is another more simple and expeditious method of procuring relief, by means of a small piece of dry sponge, or tough meat, which should be fastened to a fine silken or linen tape, so that after swallowing the sponge or meat, it may again be gradually extracted. Thus we have frequently seen pins, or sharp pieces of bone, removed without farther inconvenience. In order to facilitate the operation, a little lukewarm milk or water should be swallowed by the patient, before the string is withdrawn from the throat.

If, however, none of these expedients prove successful, it will be necessary either to administer an emetic, consisting of half a dram of ipecacunaha in powder, to be taken in a draught; or, if the patient be unable to swallow, to excite vomiting by stimulating his throat with a feather dipped in sweet oil; and, if this attempt likewise be ineffectual, a clyster, made by boiling one ounce of tobacco in three quarters of a pint of water, and then straining the decoction, should be given in dangerous cases—such an injection has often been attended with speedy vomiting, and the consequent discharge of the substance which obstructed the gullet.

After these remedies have been fairly tried, no other prospect remains of saving the patient's life, than by opening the wind-pipe, an operation which, in the hands of a skilful surgeon, is neither difficult, nor painful to the person threatened with suffocation.

GUM, a concrete vegetable juice which possesses no peculiar smell, or taste; it forms a viscid or mucilaginous solution in water, but is not acted upon either by spirits or oils: it burns in fire without melting or inflaming, and is not dissipated by evaporation.

Gums are divided into two classes, *genuine* and *impure*. In the former class are Gum Arabic, Gum Senega, and Gum Tragacanth: the gums of plum and cherry trees, &c. The latter are such as contain a greater or less proportion of resin.

Gum Arabic exudes from the *Mimosa Nilotica*, or Egyptian Acacia, which abounds in Africa; but according to Dr. SWEDIAUR, it is chiefly obtained by boiling the roots of certain trees growing in Egypt. The best gum is of a pale yellowish colour. On account of its glutinous properties, it is preferred as a demulcent in coughs, hoarseness, and other catarrhal affections, in order to obtund or mitigate irritating acrimonious disorders, and to supply the loss of abraded mucus It has been very generally employed in stranguaries, and other urinary complaints.

Gum Ammoniac See vol. 1. p. 46.

Gum Copal See COPAL.

[*Gum Elastic.* See CAOUTCHOUC. It may be dissolved in oil of turpentine or in ether. It may be imitated thus: In an iron kettle put a gallon of boiled linseed oil, one pound of bees-wax, and four pounds of glue: melt.—T C.]

Gum Elemi exudes from the *Amyris elemifera*, a native of South America, whence it is imported, and sometimes also brought from the East Indies. The best sort is rather soft and transparent, of a pale yellowish colour, inclining to green; and of a strong but pleasing smell. It was formerly employed more than it is at present, in the *compound ointment of Elemi*, which has long been used for digesting and cleansing ulcers.

Besides its utility in medicine, *gum* is of considerable service in the Arts; and, as sufficient quantities of it cannot always be procured genuine, different persons have endeavoured to contrive such substitutes, as would effectually answer the same purposes. The best of these used by the calico printers, is this: take starch, dry it in a heat that will just change its colour; it then becomes soluble in cold water.

Gum Guaiacum. See GUAIACUM.

Gum Kino. See KINO.

Gum Lac. See LAC.

Gum Senega. See SENEGA.

Gum Tragacanth. See TRAGACANTH.

GUM, or GUM-SECRETION, in horticulture, is a kind of gangrene, or morbid production of gummy matter, exuding from the wounded alburnum or sap wood of deciduous trees, arising from various causes, but mostly from injudicious pruning; bruises, or injuries committed on the wood, or bark, by the hammer in nailing the branches against walls; pinching the shoots by making the trellises too tight, or by driving the nails too closely to the branches. It may also be occasioned by leaving the foot stalks of the fruit after this has been gathered; by carelessly applying ladders; and especially where large boughs have been broken off, or inadvertently lopped.

This distemper may be known before the gummy secretion actually takes place, by the bark assuming a brownish cast, that gradually deepens, till the gum at length exudes in the form of small blisters. As soon as any of these symptoms are perceived, Mr. FORSYTH directs the infected part to be cut out with a sharp knife, till the clean white bark and wood appear; after which the *composition* and *powder* should be speedily applied. Lastly, in case any gum ooze out of the tree, it must be immediately scraped off; as the disease will otherwise rapidly increase: the best time for this operation, in the opinion of Mr. F. is during wet weather; because the gum, being moistened, may then be easily removed without injuring the bark.

Cherry and other stone-fruit trees are particularly affected with this exudation of gum, which, however, concretes in dry weather, and thus its farther discharge is prevented: otherwise the tree would *weep*, and perish from a deficiency of nourishment.

Dr. DARWIN conjectures this gummy substance to be part of the nutritious fluid designed for the new buds, which are usually formed in the summer. He proposes to obviate its exudation, by fastening a thin plate of lead on the part affected, which is previously made smooth with a knife, so that no rain or dew can penetrate: a piece of sponge, soft leather, or India rubber, might be bound on the tree beneath the lead, till the wound is healed. The doctor suggests another method of closing the wound; namely, to cut out a piece of bark from a tree of inferior value, but similar nature; to adapt it to the wounded part, after its edges are nicely smoothed, and to tie it on with list, flannel, or other bandage; in order that its elasticity may secure a continual pressure, without injuring the bark.

Mr. BUCKNALL, who has made some ingenious observations on the formation of gum, in the 12th vol. of the "*Transactions of the Society for the Encouragement of Arts*," &c. disapproves of smearing the diseased tree with tar, or any other substance that may impede the proper circulation and perspiration of the juices, as it must necessarily hurt the tree. The best remedy, in his opinion, is the *medication* (vol. 21. p. 498) for, being applied simply like a plaster, and not being extended farther than is required by the bare wood or torn bark where the gum oozes forth, it is not attended with those unfavourable effects. He farther assures the Society, that in each of these cases, "the medication becomes supremely salutary," on account of its drying qualities; for the wounds heal in one half of the time they would close, when exposed to heat, cold, moisture, and vermin.

GUM, or YELLOW GUM, is a species of *Jaundice*, to which infants are liable, in consequence of a retention of the meconium, or when the bowels are obstructed after their birth.

This affection may be cured, by occasionally administering any mild purgative: as castor oil, or magnesia.

GUM-BOIL, *Parulis*, is an affection of the gums, commencing with inflammation, and generally terminating in an abscess.

Gum-boils usually arise from violent pains in the teeth. They are to be treated with discutients, like other inflammatory tumours, but, if these fail, or the disorder be neglected, it is apt to produce a fistula. When the softness of the tumor evinces that the matter is properly suppurated, it should without delay be opened by the lancet, to prevent the matter from lodging there, eroding the bone, and causing a fistula, or caries. After this operation is performed, the matter should be gently pressed out with the fingers, and the mouth frequently washed with lukewarm Port-wine and water.

GUMS, in anatomy, are hard fleshy substances in both jaws, surrounding the teeth, and keeping them firm in their sockets.

Gums frequently become spongy, and separate from the teeth: this is often occasioned by a tartarous kind of crust, which is formed about them, and, on the separation of which, the gums return to their pristine state: to promote this favourable change, make daily use of the tooth brush.

Another disorder incident to human gums is the scurvy, which frequently breaks out on them, while it does not appear on any other part of the body. Indeed, when a scorbutic complaint attacks the whole system, the first symptom is a putrid state of the gums. In such case, a rigid diet, consisting chiefly of ripe fruit and mucilaginous vegetables, will be the best corrective.

GUN, or **Musket**, in the military art, is a kind of fire-arms, or weapon of offence, which forcibly discharges a ball, or other hard and solid substance, through a cylindrical tube, by means of inflamed gunpowder.

As numerous misfortunes happen with loaded guns and pistols, especially to careless youths and children, we suggest the propriety of removing the *flint* every time fire-arms are carried into a house; or never to suffer young people to touch them. Indeed, the artist who will contrive a moveable hammer, or at least the upper part of the hammer containing the flint, which might be easily and instantly fixed on the spur of the occasion, would be the instrument of saving many useful lives, and well deserve to be rewarded by the public; for all other inventions of stop-locks, &c. do not afford sufficient security.

GUNNY-BAGS. A species of bagging in the East Indies, employed to bring over sugar, salt-petre, pepper and coffee. The plant which yields the fibre whence this flax-like substance is obtained, is called by the natives of Bengal, *Paat*, with additional names to distinguish the several varieties. The fibre is called *Jute*, and much cultivated in Bengal for the purpose of making sacking, ropes and twine. The cost of this article in Bengal is about 67 cents per cwt.

Strong *Demy*, *Crown*, and cartridge paper, for grocers, druggists, &c. may be made from this article, as shall be more particularly stated under the article Paper.

GUNPOWDER, a granulated composition of salt-petre, sulphur, and charcoal, which readily takes fire, and when secluded from the air, rarefies or expands with great vehemence, by means of its elastic force.

The invention of gunpowder is attributed to Barthold Schwartz, a German monk; but there is reason to believe it was not unknown in the time of Alexander the Great; and that Roger Bacon, in 1292, understood the nature of its component parts; though it was generally introduced into Europe only about the middle of the 14th century.

The effects of gunpowder, in mines, &c. may be considerably increased, by leaving some space between the powder and the wadding. Hence, in loading a screw-barrel pistol, care should be taken that the cavity for the powder be entirely filled, so as to leave no space between it and the ball, because musquets, fowling pieces, &c. are very apt to burst, if the wadding be not rammed down close to the powder.

Mr. R. Coleman, of the *Royal Mills, Waltham Abbey*, gives an excellent paper on the subject of gunpowder, from which the following is extracted. See Tilloch's *Philosophical Magazine*, vol. 9.

Gunpowder is made from the following proportions of ingredients, viz. to each hundred parts,

Salt-petre	75 to 76
Charcoal	15
Sulphur	10

The first thing to be attended to is the purity of the articles.

The salt-petre is refined by solution, filtration, evaporation, and chrystallisation: after which it is fused, taking care not to use too much heat, that there may not be any danger of decomposing the nitre: by this means, it is not only rendered more pure, but the water of chrystallisation more certainly got rid of.

The sulphur is refined by melting and skimming: the most impure is refined by sublimation.

The charcoal is best made in the following manner: The wood to be charred is first cut into lengths of about nine inches, and then put into an iron cylinder or retort, which is placed horizontally. The front opening of the cylinder is then closely stopped: at the farther end are pipes leading into casks. The fire being made under the cylinder, the pyro-ligneous acid, attended with a large portion of *carbonated hydrogen gas*, comes over. The gas escapes, and the acid liquor is collected in the casks. The fire is kept up till no more gas or liquor comes over and the carbon remains in the cylinder. The proportion of powder used for the several pieces of ordnance by the navy, has been reduced one-third in consequence of the increased strength of the composition into which this cylinder charcoal enters.

The wood must be felled in the summer, and must have the bark taken off before charring. The wood used is either alder, willow, or (black) dogwood. But if distilled, the choice of wood is not material. 1. Each ingredient must be separately ground to a fine powder; 2. Mixed together in the proper proportions; 3. The composition is then sent to the gunpowder mill, which consists of two stones vertically placed, and running on a bed-stone. On this bed-stone the composition is spread, and wetted with as small a quantity of water, as will, together with the revolutions and weight of the runners, bring it into a proper body, but not into a paste. Only about forty or fifty pounds of composition are worked at a time; these mills are worked either by water or horses.

The composition taken from the mills is sent to the corning house to be corned or grained. Here it is first passed into a hard and firm body, broken into small lumps, and the powder then grained, by these lumps being put into sieves, in each of which is a flat circular piece of lignum vitæ. The sieves are made of parchment skins, having round holes punched through them: several of these sieves are fixed in a frame, which by proper machinery has such a motion given to it, as to make the lignum vitæ runner in each sieve, go round with quick velocity, breaking the lumps of powder, and forcing them through the sieves, forming grains of several sizes. The grains are then separated from the dust by proper sieves and reels.

They are then hardened, and the rougher edges taken off, by being run a sufficient length of time in a close reel, having a proper circular velocity given it.

The powder, thus corned, dusted and reeled, is sent to the stove and dried; taking care not to raise the heat so as to decompose the sulphur. The heat is regulated by a thermometer placed in the door of the stoves, if dried in a gloom stove. This gloom is not in a heated state, when the powder is taken in and out of the stove, and is furnished with a copper and other coverings. The Editor, Mr. Tilloch, suggests the propriety of heating the stoves by means of steam tubes, and Mr Coleman approves the plan.

A good idea may be formed of the purity of gunpowder, and some conclusion as to its strength, by the following mode:

Lay two or three small heaps (a drachm or two) on separate pieces of clean writing paper: fire one of them by a red hot iron wire; if the flame ascends quickly, with a good report, leaving the paper free from white specks, and does not burn it into holes; and if no sparks fly off, setting fire to the adjoining heaps, the goodness of the ingredients and proper manufacture of the powder may be safely inferred; but if otherwise, it is either badly made, or the ingredients impure. The strength of gunpowder does not depend on the granulation, the dust of gunpowder after manufacture, having nearly the same force as when granulated.

[The nitre for gunpowder must be purified from common salt by boiling: the common salt chrystallises first and must be taken out by a perforated skimmer. If nitre decrepitates, thrown on a hot coal, it contains much common salt: or, if a solution of it precipitates nitrate of silver. Gunpowder made of such nitre will deliquesce. The wood should be charred in a sheet-iron case, according to Kurtz's patent taken out in the United States, in 1817. For priming, the common powder may be mixed with 1-50th part of oxymuriate of potash.—T. C.]

The United States have within a few years past, suffered a great loss, by the navy powder absorbing so much moisture, as to render it unfit for use in a second cruise. To remedy this evil, the vessels intended to preserve gunpowder, ought to be perfectly air-tight. Wood, however close, does not effectually secure the article from moisture. It has been remarked that any vessel, in which salt of tartar can be preserved dry, will of course keep gunpowder in the same state of perfection as when first inclosed. Demijohns wickered, and packed in hay, would answer well to keep powder if filled to the top, corked, covered with bladder, and rosin put over the whole. Kegs made of well seasoned oak, lined with lead, may be used. For domestic purposes, a bottle corked up, the top of the cork cut off, and the whole aperture covered with a plaster of thick drying paint, or wax, or turpentine, spread on a piece of tin foil, would answer well.

GUTTA SERENA, or *Amaurosis*, signifies the loss of sight without any other visible cause or defect in the eye; except that the pupil (or the round hole for admitting the rays of light) is generally deprived of its power of contraction.

There is another disease, called *cataract*, namely, a dimness or loss of sight from the interposition of an opaque film, either in the eye itself, or in the eye-lids. This malady generally takes place by imperceptible degrees; it is often consequent to inflammations of the eyes, and arises from the abuse of spiritous liquors, external injury, and mortification; acrid vapours, &c. If it has continued for some time, the cataract must be couched, or extracted by the skilful hand of a surgeon; as there is no other prospect of removing it.

GYMNASTICS, or the Athletic Art, denotes the dexterous performance of certain exercises of the body, whether for defence, health, or amusement.

On the first institution of society, men being aware of the necessity and advantage of military manœuvres, for repelling the attacks of enemies, national games were established; and public rewards were granted for the encouragement of youth. These exercises consisted of running, leaping, swimming, wrestling, &c. Although, from the change of manners, and the different systems of tactics now prevailing, such games become less requisite, yet as they doubtless contribute to the preservation of health, and tend to invigorate the juvenile body, we conceive that they might, with certain restrictions, be advantageously re-established in academies. A discussion of this interesting subject, however, being foreign to our plan, we refer the reader to M Salzmann's "*Gymnastics for Youth*," 8vo. 1800; which is an useful practical guide, and merits the attention of those who are concerned in the superintendance of schools. This work is reprinted in the U. States.

GYMNOSOPHISTS, a sect of philosophers of India, of which the greater part were highly respectable men; but who were thus termed (naked philosophers) because the heat of the climate obliged them to wear as little clothing as possible. Their philosophy had a general resemblance to that which has always been received in India throughout. It should be observed, that the ancients called him *naked* who was without his upper garment, or that loose robe or cloak over the tunic, which the Greeks denominated *imation*: thus, David is said to have danced *naked* before the ark, merely because he threw aside his cloak.

GYMNOTUS, a genus of fishes, including nine species, of which the most remarkable is the Gymnotus electricus, to which we have alluded in the article Electricity. This fish is found in the hot climates of Africa and America, particularly in the rivers of Surinam and Senegal. It has the power of giving an electrical shock to any person, or to any number of persons who join hands together.

GYPSIES, or Egyptians, an uncivilised nation of people, who are dispersed over Europe, Asia, and Africa. They made their first appearance in Germany, about the beginning of the sixteenth century. It appears that they are as much foreigners in Egypt as in any other part of the world. Their origin is wholly obscure. Some suppose them refugees from Hindostan. In countries where they are greatly discountenanced, they are extremely indolent, and consequently compelled to subsist dishonestly. In proportion as they are encouraged they are industrious. This is the case in Turkey. A liberal policy would probably destroy their corporate existence in all nations. At present, they are chiefly known in Europe as petty thieves, and pretenders to skill in that universal superstition, the prediction of things to come.

GYPSUM, or Alabaster, is a variety of sulphate of lime or of lime in combination with sulphuric acid, which has a shivery and glittering texture; and is of white colour tinged with grey or red, and sometimes striped, veined, or spotted. When chrystallised the primitive form of its chrystals is a regular four-sided prism.

It is found in Derbyshire and other counties of England, as well as in various parts of the continents of Europe and America. That of Italy and Spain is considered the purest and most valuable.

Being considerably softer than marble this mineral is not capable of receiving a good polish. From this circumstance it is, however, the more easily worked; and is manufactured into chimney-pieces, ornamental vases, and lamps: the latter transmit a soft and pleasing light. Such is sometimes the transparency of alabaster that it has been employed for windows: and at Florence there is now a church which receives its light through the medium of this substance.

The ancients, though acquainted with the art of making glass, had not attained the knowledge of reducing it into thin transparent plates; and frequently employed alabaster for windows. Of this stone the Temple of Fortune, which was built by order of the Emperor Nero, was erected. It had no windows whatever, and received only a soft kind of light through its walls; appearing rather as if the light issued from the interior than that it was admitted from without.

The hot springs of St. Philip, which supply the baths of Tuscany, are so strongly impregnated with alabaster, that artists take advantage of this to obtain impressions of bas reliefs, by merely exposing their moulds to a current of the water, until they become filled with the earthy deposit. These impressions when taken out are found to be as hard as marble, and are very beautiful. There are in the British Museum some casts of medals formed from the water of these springs.

When alabaster is heated it falls into a soft white powder, which on being mixed with water absorbs it so rapidly, that if it be formed into a paste, it dries and becomes hard in a few minutes. In this state it is called *plaster of Paris;* and is employed for the making of statues, casts, and other ornamental work, which though of a beautiful white colour are very brittle. When mixed with coloured gummy or glutinous substances, it yields plasters of different hues, and has the name of *stucco* This plaster is much in request in the northern counties of England, for the floors of dairies, store-rooms, granaries, and other apartments; and when properly formed it constitutes a very smooth and durable flooring. Of late years it has been advantageously employed as a manure for fertilising the soil.

* The history of the introduction of this inestimable article into the state of Pennsylvania is of importance, as it will tend to add another instance to the many with which the world abounds, of the great prejudices which oppose those who attempt improvements, and of the difficulties that attend the laying aside old established habits and practices, however absurd or unprofitable. The history of our progress in the use of gypsum in Pennsylvania, will also serve as powerful encouragement to those who have experienced the benefit of new processes, but are deterred from making them public by the fear of ridicule from fools, the opposition of theorists, or the mortification arising from the neglect of the careless.

About thirty-eight years since, Mr. Guyger, a native of *Koshehopen*, Bucks county, Pennsylvania, who had removed to Germany, sent a keg of ground *gypsum* to Mr. Jacob Barge, innkeeper of Philadelphia, and mentioned that it had been found highly beneficial in Germany as a manure for clover, requesting him to purchase any farm on which the stone was to be found, as he wished to return to America. The keg was left at Rotterdam, to which place it was sent to be shipped; but Mr. B. determined upon putting to the test the character given of the stone. He therefore obtained some from a manufacturer of burr mill-stones in Philadelphia, and strewed it in the spring, on a moist place, (where a scythe never had been used,) in a water meadow belonging to Mr. Hocker of White Marsh.

The first account Mr. B. had of the success of the experiment was after some months, when he was informed of the uncommon luxuriance of the grass, and of its superiority to that in other parts of the meadow. Mr. Hocker being convinced, immediately tried the *gypsum*, and Mr. Lancaster, his neighbour, followed his example. Mr. Clifford near Bristol, Pennsylvania, and David Deshler of Philadelphia also used it at an early period. Afterwards the late Mr. Stoneburner of Germantown used it, and by the superiority of his crop of grass over those of his neighbours, who had manured very highly with stable manure, shewed them its importance, and induced them to employ it. The uncommon product of the land when strewed with the gypsum, as might be expected, became a general subject of conversation, and the demand became so great, that Mr. Barge was induced to erect a band-mill to grind it. He also continued to use it in the vicinity of Philadelphia, and thus to spread its fame. Richard Peters, Esq. also became an early proselyte to the opinion of its virtues, and has done much towards destroying the prejudices against it, by pointing out the particular soils in which it answers best. Still, however, from the absurdity of some people, who expected it to do wonders on all soils, in all situations, in every crop, and under all circumstances, and did not find it answer their expectations, doubted the facts stated, and even opposed its use. But all opposition has been surmounted, and it is now in such demand, that the importation of this article alone gives employ to many vessels from the Bay of Fundy, and few wagons leave Philadelphia without carrying some home. Mills going by horses are erected with the sole view of grinding it, and machinery for the same purpose is connected with the grist-mills throughout the country.

The utility of *gypsum* to grass, was discovered in the following way, as stated by Mr. Guyger to Mr. Barge. A labourer at a gypsum quarry, near Hilbrun in Germany, was in the habit of walking across a meadow after his work, in order to shorten the distance home: and that he might avoid a discovery of the trespass, he frequently varied his direction. In the course of the season, he remarked the uncommon luxuriance of the grass in the directions which he had been accustomed to take in his route home, and imagining that it must have proceeded from the dust of the gypsum which fell from his clothes, tried the experiment to determine the point. The event answered his expectations. The effect was communicated, and soon made public.

We owe much to R. Peters, Esq. for the pains he took a few years since in collecting from various intelligent practical farmers in Pennsylvania, the result of their experience with respect to gypsum; and for embodying it in a small volume.[*]

[Gypsum is not part of the *food* of plants: it is a manure of *stimulus;* exciting the organs of the plant to stronger action. It will not answer beyond two and a half bushels per acre; 1½ bushel is better: it will not answer on wet, or swampy, or clayey soils, or near the sea coast. On these soils it is either washed away, or (as on clays) it does not penetrate to the roots of the plant. On mere sands, it is washed down beyond the roots. It does not answer in England so well as in America, owing to the moisture of that island. It should be scattered over the ground as a top-dressing. Suppose you are asked if a stone brought you is gypsum? 1. Gypsum can be scratched by the nail, scraped by a knife, ground by the teeth. 2. It will not dissolve in spirit of salt as limestone will: nor will it effervesce as limestone will: nor is it half so hard as limestone. 3. Its colour and chrystalline appearance distinguish it from clay: nor does it give a clayey odour when breathed upon, unless clay be mixed with it. 4. Powder it: boil it to dryness, with four times its weight of pot or pearl ash. Wash out all that hot water will dissolve: the remaining powder (if the stone be gypsum) is carbonate of lime.—T. C.]

GYRINUS, the water-flea, a genus of insects of the order coleoptera: they are found on the surface of waters, on which they run with incredible velocity; when attempted to be taken, they plunge to the bottom, drawing after them a bubble very similar to a globule of quicksilver. The Gyrinus natator is the only European species: this has a surface so bright as to shine like a mirror in the sun. The larva is of a very singular aspect, having a lengthened body furnished with many lateral appendages down the body. It is a highly curious object for the microscope. When its change arrives, it forms for itself a small oval cell or case on a leaf of some water plant, and after casting its skin it becomes a chrysalis; these animals, like other beetles, fly only by night.

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[*] Entitled, "*Agricultural Enquiries on Plaster of Paris.*"

H.

H, the eighth letter in the alphabet, is said by some grammarians to be only a hard breathing. H, used as a numeral, denotes 200, and with a dash over it H̄, 200,000.

HABEAS-CORPUS, in law, a writ which is the bulwark of personal freedom. In cases of private oppression, where one individual unlawfully confines another, this writ directed to such detainer, commands him to produce the body of the prisoner, with the date and cause of his caption and detension, to do, submit to, and receive whatsoever the judge or court, awarding such writ, shall consider in that behalf.

By the action of this writ, of which are several kinds adapted to different occasions, relief from all unjust imprisonment may be obtained, causes removed from one court to another, for the promotion of justice, and prosecutors compelled to bring the prosecuted to open trial, instead of prolonging his imprisonment.

HADDOCK, or *Gadus eglesinus*, L. a species of fish which periodically frequents the Yorkshire coast, in large shoals, and commonly weighs from two to three pounds.

Large haddocks are in roe, from the middle of November to the end of January; but, in the succeeding three months, they are said to be out of season. In the month of May they recover their flavour, and continue to improve till January, when they are in the greatest perfection.

These fish grow to a considerable size, weighing sometimes fourteen pounds; but in such case their flesh is coarse, and not proper for the table: hence those of an inferior bulk are more esteemed when their weight does not exceed two or three pounds.

HAIL, in meteorology, a meteor consisting of vapour more intensely frozen than when it appears in the form of snow. BECCARIA supposes it to be formed in the higher regions of the atmosphere, where the cold is extreme, and where the electric matter is very copious. In these circumstances, a great number of particles of water are brought near together, where they are frozen, and in their descent collect other particles, so that the density of the substance of the hail-stone grows less and less from the centre; this being formed first in the higher regions, and the surface being collected in the lower. Agreeably to this, it is observed that, on mountains, hail-stones, as well as drops of rain, are very small, there being but little space through which they can fall, and increase their bulk. Drops of rain and of hail also agree in this, that the more intense the electricity that forms them, the larger they are. Motion is known to promote freezing, and so the rapid motion of the electrical clouds may produce that effect. A more intense electricity also, he thinks, unites the particles of hail more closely, than the more moderate does those of snow. In a similar manner, we see thunder clouds more dense than those that merely bring rain; and the drops of rain are larger in proportion, though the height from which they fall is not so great. In general, the core of the hail-stone is hard, and the outer part soft; as if the intense freezing region was in the highest regions, and particles less frozen had been attracted to it in the course of its descent: in particular instances the fact is exactly the reverse

HAIR, small filaments which issue from the pores of the skins of animals, and which serve them as a natural covering.

Hair is found on all parts of the human body, excepting on the palms of the hands and the soles of the feet; but it grows to the greatest length on the head and chin. It is subject to few diseases; the only affection that can in this country be strictly considered as a disease, is BALDNESS; for which we have pointed out the most proper remedies.

Frequent cutting the hair is very beneficial to the ears, eyes, nay, to the whole body: and if the head be washed or immersed daily in cold water, it will be found a preventive of periodical head-achs.

The hair is, by all nations, considered as an ornament to the person, more than as a covering for the head, provided by the beneficent hand of nature. Hence various pomatums, and other secret preparations, have been imposed upon the public, for the purpose of "making the hair grow long and thick."

The hair of beavers, hares, and other animals, is used in various manufactures, especially that of hats, of which they constitute the principal material.

Hair, in farriery, is commonly called the *coat*; and, with respect to horses, merits particular consideration. The hair growing on the fetlock, serves as a defence to the prominent part of it, when the animal is travelling on rough, stony roads, or in frosty weather. If the hair on the neck, and more exposed parts be close and smooth, it may be concluded that the horse is in health.

The hair of a horse's main and tail is apt to fall off, especially if they have been suddenly overheated, so as to engender, what is called in the language of the stable the *dry-mange*. A similar effect will follow, after he has been surfeited, so that the foul humours are repelled into those extremities of the body. To remedy such disgusting appearance, the horse's mane, &c. should be anointed with black soap, and the animal washed with a strong ley prepared of wood-ashes. If, nevertheless, a canker arise on the animal's tail, it will be requisite to apply diluted oil of vitriol, which will corrode, and prevent it from making farther progress.

Horse-hair likewise forms a considerable article of trade. It is partly employed for weaving the covers of the seats of chairs, sofas, &c. but principally for the stuffing of bolsters and mattresses. For the last mentioned purposes, the hair is previously baked, and in that state, forms one of the most elastic couches.

HAIR-GRASS, or *Aira*, L. a genus of perennial plants, comprising 24 species.

HAIR-POWDER is generally prepared from starch, which, after being thoroughly dried, is ground and passed through the finest sieves. In its pure state, it should be perfectly white, and possess no smell. But in order to conceal base adulterations, or to please the votaries of the *toilette*, perfumers study the art of communicating to it various artificial odours from sweet-scented flowers, such as violets, jasmines, &c.

Dr. Darwin observes, that alum is sometimes used in the manufacture of hair-powder; and we understand from credible persons, that even lime is frequently mixed with fine flour: it is therefore not surprising that so many persons who employ hair-dressers display bald heads, and are under the necessity of wearing wigs; but, if the latter were aware of the injury they inflict on themselves by inhaling such pernicious substances, in consequence of which many who exercise that trade, pine away of pulmonary complaints, they would never use any other but genuine powder. And though common flour is not in itself pernicious, when used as a substitute for hair-powder, yet by the mucilage it contains, the hair is apt to be caked together when the head is sensibly perspiring, or is accidentally wetted by a shower of rain: an effect which may be frequently noticed in a whole regiment of soldiers.

HALO, in natural history, a coloured circle appearing round the body of the sun, moon, or any of the large stars.

HALTING, among farriers, signifies an irregularity in the motion of a horse, arising from a lameness, or other injury in the shoulder, leg, or foot, which induces him to spare that part, or exert it too timorously.

As an intimate acquaintance with this defect is of considerable importance to the farmer, we shall briefly state the principal circumstances connected with the subject.

If a horse halts, the lameness may be discovered either *before*, in which case the malady is seated in the shoulder, legs, or feet; or *behind*, when it lies in the hip, ham, &c.

1. When the cause of the affection proceeds from the shoulder, the horse does not lift up his leg, but drags it on the ground, or casts one of them more than the other, and keeps the knee in a manner unbent. On turning short, he will evidently favour the lame leg. Hence the injury must be either in the top of the shoulder blade, called the *withers*, which is known by the animal halting most when a person is on his back; his frequent shrinking: and, if pressed with the hand about the top of the shoulder-blade, attempting to bite: or, the hurt may be at the lower end of the shoulder-blade; in which case he treads with *thick steps*, shrinks, and is

ready to drop on being squeezed in that part. When it arises from the elbow which joins the marrow-bone to the leg, the horse winces, and draws up his foot, on slightly pinching the part above-mentioned.

2. If the lameness be in the *legs* (in which case it is in the knee, or pastern joint), the horse refuses to bend either the one or the other, and walks stiffly on that leg; or, when it appears in the *shank*, it will be discovered by some splint, screw, windgall, or other visible malady.

3. If the defect be in the foot, it is either in the *coronet*, and proceeds from a strain; or it becomes evident by a hot and inflamed tumour. Or, if it be situated in the *heel*, it may have been occasioned by an over-reach, which is discernible by the eye, as well as by the animal's treading entirely on his toe. When a horse halts more on sloping than on plain ground, the mischief is seated between the *quarters*. This kind of limping is sometimes occasioned by being pricked with a nail in shoeing; in which case, the offensive nail may be distinguished by pinching the head of each together with the hoof.

Should a horse *halt behind*, from a disorder in the hip, he will walk sidelong, and not follow so easily with that leg as the other; nor will he turn on the side affected, without favouring the leg. This cause of lameness is particularly discoverable when the animal, in walking on the side of a bank, lifts up the injured leg higher than the other. Like all injuries of the hip joint, that last mentioned is most difficult to be cured; and, in every species of the affections before described, total abstinence from hard labour, proper feeding, and, according to circumstances, either moderate exercise or complete rest, are essential requisites to a speedy recovery.

HAM, the lower part of an animal's thigh, adjoining to the knee; or the angle in which the leg and thigh, when bent, incline to each other.

HAM, or Gammon, (*Jambon*) in commerce, denotes the thigh of a hog or bear, dried, seasoned, and prepared so as to preserve it.

Hams may be cured, in order to resemble in taste those of *Westphalia*, by the following process: Sprinkle a young ham of pork with dry salt, let it lie for 24 hours to drain off the blood, then wipe it perfectly dry, and take one pound of brown sugar, a quarter of a pound of salt-petre, half a pint of bay salt, and three pints of common salt; boil these ingredients in an iron pan over the fire. In this pickle the ham must be suffered to remain for three weeks, frequently turning it, when it should be suspended in a chimney for drying, by means of smoke from no other but a wood fire.

Hams may be cured by POCOCK'S recipe for curing BEEF, which see, vol. 1. p. 192.

To cure hams, as practised in Virginia Take 6 lbs. of fine salt, 3 lbs. of brown sugar, or 3 pints of molasses, 1 lb. of salt-petre, powdered; mix all these together, to serve for 24 hams: rub each ham well, all over, with this mixture, and pack them down in a cask or tub, and let them so remain for 5 or 6 days; then turn them, and sprinkle some salt lightly over them, and so remain 5 or 6 days more; then add brine or pickle, strong enough to bear an egg, and let them remain covered with it for a month; when they will be fit to smoke.

Another mode, equally good and more simple: To four gallons of soft or river water, add one pound of brown sugar, 4 ounces of salt-petre, 8 pounds of coarse salt; boil all these together and carefully take off the scum of dirt as it rises. When clear, let it remain till cold; then pour it over the meat till covered: and the quantity of pickle must be increased according to the quantity of meat. The meat must not be pressed, but put lightly into the cask, and remain for 6 or 7 weeks; when it will be fit to smoke.

HAMAMELIS: Witch hazel. There is only one species of this natural plant, viz. *Virginica*.

The Indians apply the bark, which is sedative and discutient, to painful tumours and inflammations. A cataplasm of the inner rind is found to be very efficacious in removing painful inflammations of the eyes, according to Dr. CUTLER, *Amer. Acad. Mem.* 1. Mr. BARTRAM says, that "this shrub grows ten or twelve feet high, from one common root, producing blossoms late in the autumn, and in mild winters, through almost all the season, and exhibiting a singularly pleasing appearance; for, then divested of its foliage, the twigs appear fringed in gold. Brooms are made of the poles of this plant."

HAMSTER, (*Mus cricetus*) a large species of rat, with short tail, which is very common in many parts of Germany, and is of use to some of the peasantry of that country, on account of the great store of corn, beans, peas, and other provisions which it lays up for the winter. The peasants by experience know nearly the parts of their burrows under the ground in which these are deposited; and in the early part of winter they dig out both the animals and their stores. The former are valuable for their *skins*, and the latter seldom fail to afford them a couple of bushels of good corn in each habitation In some parts of Poland the inhabitants eat the *flesh* of the hamster.

It must be observed that, although this animal is so far useful, it is very injurious to the farmers in destroying their corn.

HARE, the Common, or *Lepus timidus*, L. is distinguishable from all other animals of its tribe by the ears being tipped with black, and longer than the head; the hind-legs being half as long as the body, and the tail short.

It is found in every quarter of the world except Africa.

No withstanding the great estimation in which the *flesh* of the hare is now held as food, it was formerly as much detested, even by the inhabitants of Great Britain; being absolutely forbidden by the Druids, and abhorred by the Britons for many centuries after the abolition of that order. At the present day it is not eaten by the inhabitants of many eastern nations. It is prohibited by the Mahometans and Jews; and the Cophts, who have adopted many of the Jewish customs, refrain from it. The ancient Romans however considered it so great a delicacy for the table, that Martial styles the hare in this view the first of quadrupeds

The *fur* of the hare forms an important article in the manufacture of hats, and vast quantities of hares' skins are for this purpose annually brought from Russia and Siberia. This is the chief use which we make of them; but in some parts of the continent the fur is spun and woven into a kind of cloth. The inhabitants of Dalecarlia, a province of Sweden, set a peculiar value upon such cloth, from an opinion that it is itself so attractive to fleas as to preserve the wearer from their attacks! The Romans spun the fur both of the hare and rabbit into cloth; but Pliny says that such cloth was neither soft nor durable.

In the extreme northern countries where the frosts of winter are intense, and where snow lies upon the ground for many successive months, all the hares at the approach of that season change their coat, and instead of retaining a coloured fur become perfectly white.

The chase of the hare is at this day a popular amusement in most parts of England; and four or five centuries ago it was so much followed, that even ladies had hunting parties by themselves, in which they rode *astride* upon the saddle.

It is sometimes difficult to ascertain the excellence of hares for the table, but the following directions may be of use. When newly killed the body will be stiff, and the flesh of pale colour: but when they have been some time killed the body becomes limber, and the flesh gradually turns black. A young hare may be known from an old one, after it is dead, by the bones of the knee joint. If, on thrusting the thumb nail against this joint, the bones are somewhat separate, the hare is young; if there be no space, it is old: and the greater the separation, the younger the animal may be considered. The under jaw of a young hare may easily be broken, and the ears easily torn; the cleft also of the lip is narrow, and the claws smooth and sharp. In an old hare the cleft of the lip spreads very much, the claws are blunt and rugged, and the ears dry and tough. Hares keep better if they are not opened for four or five days after they are killed; and they are considered in the best state for the table when the colour of the flesh is beginning to turn.

So numerous are these animals in some parts of England, where attention is paid to preserving the breed, that they become greatly injurious to the crops of all the neighbouring farmers. They feed upon green corn, clover, and other useful vegetables; and frequently commit much damage in young plantations, by eating the bark from the trees. Some years ago a gentleman in Suffolk found it necessary to destroy the hares near some new plantations, and 1082 were ascertained to have been killed.

Amongst the mountains of Siberia there is a very small species of hare, called by English writers Alpine Hare (*Lepus alpinus,*) which lives in burrows or holes under ground, and stores up, under the shelter of trees or rocks, large ricks of dried grass and other vegetables for their winter's subsistence. These collections are anxiously sought after by persons engaged in the hunting of sables, and in many instances they are means of absolutely preserving their horses from perishing by famine.

Some of the adjacent peasantry also search them out as food for their horses and cattle. The *skins* of the Alpine hares supply one of the articles of commerce betwixt the Russians and Chinese.

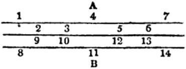
Hares breed in the first year, and the female generally produces four or five leverets, after a gestation of about thirty days. Unlike dogs, the eyes of these animals are open at their birth; and, after being suckled for about three weeks, they are abandoned to their own fate. They seldom appear in the U. States south of the 42° of south latitude.

HARP, a musical instrument of the stringed kind, and which, in various forms, appears to rank among the most ancient inventions. The harp, peculiarly so called, was the instrument of the northern nations of Europe. The harps of Wales, and of Ireland, differ from each other. By the Welsh laws, a harp was one of the things that were necessary to characterise a freeman, or gentleman, and none could pretend to this rank, who had not a harp, and was not able to play upon it. By the same laws, to prevent slaves from pretending to be gentlemen, it was expressly forbidden to teach, or to permit, them to play upon the harp; and none but the king, the king's musicians, and gentlemen, were allowed to have harps in their possession. The harp of Brian Boiromh, king of all Ireland, who was slain in 1014, after passing through many hands, has recently been deposited in the library of Trinity College. The workmanship bears evidence of an expert artist.

HARROW, an implement of agriculture, commonly used for the purpose of covering seed with earth. There is, however, another object, to which it may be applied, of equal importance, namely, to pulverise the soil previously to its receiving the seed.

Common harrows are of different forms. The first we shall notice, has two bulls, four feet in length, and eighteen inches apart, each of which is furnished with four wooden teeth. The second has three bulls, provided with twelve similar teeth: a third has four bulls, and twenty teeth, composed generally of iron, which are ten, eleven, or twelve inches apart. The last mentioned implement is preferable to either of the former; as, on account of its iron teeth, it is better calculated for covering the seed; but it is still very imperfect, and the use of it attended with many inconveniences. Hence different harrows have been invented at various periods, the principal of which we shall describe in the order of time.

The earliest that merits notice is the *Harrow-plough*, invented in the year 1763, by a Mr. Wood, of Chelmsford, Essex: a full account of which appears in the 2d vol. of the *Museum Rusticum et Commerciale*. It consists of a common harrow-frame, 7 feet in length, and 4 in breadth, to which are fitted 14 iron shares, of the form of a heart, with a rounded point, being hollowed underneath, and convex on the upper surface: the edges of the rounded point, and two sides of these shares, are sharpened in the same manner as a common hoe; and the shares are disposed in the following order; the letter A representing the front, and B the back of the frame.



The design of this implement is to clear turnips from weeds, &c. Each share is about 14 inches distant, and, when the harrow-plough moves forward, the shares marked 1, 4, 7, are the first, each of which cuts the plants or weeds in its way. These are succeeded by others marked 2, 3, 5, and 6, which together form seven shares. The seven remaining behind are intended to complete the work commenced by the first row. Thus each share clears about eight inches of land in width, and leaves the space of six inches untouched. This method of weeding turnips has been found much cheaper and more effectual than the common practice: for the shares cut deeper, and move the ground better than labourers will stir it with their hand-hoes. Besides, the harrow-plough, it is affirmed, will also bring land to an excellent state of improvement, after it has been three or four times ploughed.

In the "*Letters and Papers of the Bath and West of Eng. Soc.* vol. 6." is an account of an implement, invented by the Hon. Mr. R. Sandilands, and denominated by him a *Chain and Screw Harrow*, a plate of which we have annexed.

If the ridges be high, and require to be harrowed through their whole length, that object will be effected by Mr. Sandiland's implement; as by lengthening the chain (which is commanded by the screw) the harrow, when drawn along, will form an angle downwards, and thus pass over every part of the curve of the ridge in proportion to its extent; which, according to his statement, may be *nine* feet, the distance from A to B; whereas the whole extent from c to d, is said to be only about *five* feet and a half. When the crowns of the ridges have been sufficiently harrowed lengthways, the chain may be shortened by the screw, which forms an angle upwards: the harrow is then drawn by horses, one on each side of the furrow, which will be completely reduced as well as the sides of the ridges, if 18 feet in breadth.

If the harrow is to be drawn across even ground, or high ridges, in such cases, it may, by the aid of the screw, be made horizontal, so as to work in the manner of a solid harrow without a joint. The teeth of Mr. Sandiland's implement are square, and fixed in the usual way, being nine or ten inches below the wood, and of such strength as the land may require. They cut or tear the ground regularly every four inches, without clogging, unless at the extreme angles, where the teeth are necessarily put somewhat closely together: they may, however, be cleared with the utmost facility, by raising them a little from the ground. The figures 1, 2, 3, 4, &c. point out where the twelve teeth on each side of the harrow are placed.

Mr. Sandilands observes, that where a strong break harrow is not necessary, by making the teeth shorter or lighter, 48 tines may be obtained, which will tear the ground at every two inches, cover the seed well, and make a fine mould. He farther recommends to construct harrows for every purpose, and of every size, on the principle above stated; as, in such case, no tooth can follow the track of another, and all are kept in constant action.

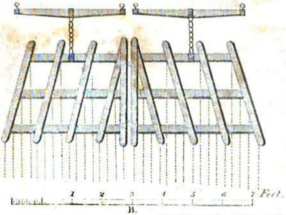
The same gentleman has also invented another implement, called a *Wrack-harrow*, from the speedy manner in which it collects the wrack or roots of couch-grass, and other noxious weeds. It is composed of a plank of timber, six feet long, nine inches broad, and two inches thick, in which are fixed two rows of teeth, viz. twelve in the front, and thirteen behind: each row is about four inches apart, and the teeth are five inches distant; so that they operate at the distance of 2½ inches from each other. They are in length about seven inches below the wood, three-quarters of an inch square, and pointed diamond-wise, so as only to catch whatever may be brought above ground by previous harrowing, without penetrating the soil. To the plank are joined shafts for a horse, and handles for a man to guide it, of such length and strength as may be deemed necessary.

This machine is used in the following manner: When all the weeds are brought to the surface, the wrack-harrow is drawn across the field; the person who holds the handles pressing a little on them, till the plank has passed over the first furrow, on which the harrow is suddenly lifted, without stopping the horse; thus all the weeds collected by the harrow will fall into the furrow, whence they may be removed or burnt, at the option of the farmer. If, however, the horse be not steady, it will be requisite to employ a boy for the purpose of leading him; in order that the couch-grass, &c. may be properly eradicated.

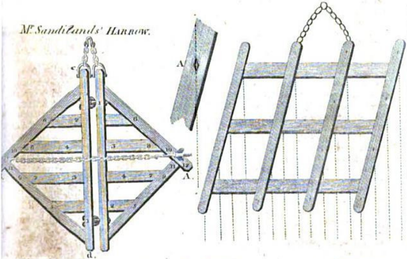
A patent was granted in the year 1799, to Mr. William Lester, of Yardley-Hastings, Northampton, for his invention of a harrow, by which the inconveniences attending the implements constructed on the common plan may be effectually obviated.

The patentee makes his harrows of various sizes, to be drawn by one, two, four, or six horses, so as to suit every kind of soil. The first size is six feet in width, and of equal length; the teeth are twelve inches distant in every direction, and there is an interval of one inch and a half between their tracks, in every line of draught. This size is more peculiarly adapted to harrowing in every species of grain and seed, especially on *lay*, *flag*, or *whole-land*. The second size is 7½ feet wide, and six feet nine inches in length; the teeth are fourteen inches asunder in every direction, and an intermediate space of two inches occurs between their tracks, in each line of draught. This implement is particularly calculated for clearing foul land. The third size is nine feet in length, by seven feet nine inches in breadth; the teeth are sixteen inches apart in every direction, and a space of 2½ inches intervenes between the tracks in each line of draught. The last mentioned harrow is, in the opinion of the patentee, eminently adapted to the cultivation of foul land, especially for clearing *fen-fallows* of couch-grass.

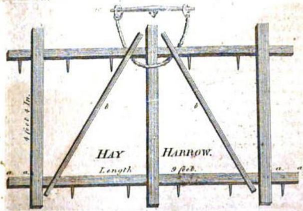
The superiority of Mr. Lester's patent harrow, is stated to consist in the



Mr. Wynne's Harrows.



Mr. Sandilands' Harrow.



HAY HARROW.

Length 9 feet.

impossibility of its clogging, or driving the soil together in heaps. Being divided into two parts, of equal lengths (which are drawn by two centres united in a third), it has a steady uniform motion, and is effectually prevented from diverging into any oblique direction. Another excellence in this contrivance is, its *couching* over both ridges and furrows, and its yielding to all the inequalities of the soil; besides, from the diagonal position of the bulls, and the irregular arrangement of the teeth, each tine is drawn in a different direction, so that no one tooth can follow another in the same track; whereas, in the common harrows, one half of the teeth run in the same course.

In the 9th volume of the *Letters and Papers of the Bath and West of England Society*, there is a description of a pair of harrows and of a drag, or heavy harrow, invented by Mr. H. WYNNE. His implements are constructed in such a manner, that each pin makes a separate track, and that the intervals between those tracks are all equal; so that the entire ground, over which the harrow passes at one time, will be marked with lines three inches apart. The pair of harrows is seven feet six inches broad; and the inventor asserts, that the same horses will, by means of it, work one-fourth more ground, and perform such labour much better, than by any other harrow. Mr. WYNNE's implement is stated to possess this farther advantage, that when the pins or teeth sink into the earth, the posts being nearly parallel to the line of draught, admit all roots, stones, and other obstructions to pass freely between them, and also beneath the rails by which they are connected. And, as the hinge is within the tine, when the harrow is drawn up and down ridges, it accommodates itself to the shape of the ground; the joint rising when the harrow is on the top of the ridge, and sinking when it is in the furrow.

The drag, or heavy harrow, likewise invented by Mr. WYNNE, is constructed without a joint, and will work a piece of land six feet three inches in breadth, leaving intervals of five inches between the tracks. The principle is similar to that on which the implements just described are formed; and which, the inventor says, is applicable to harrows of any size; as the intervals between the tracks may be varied at pleasure, the regularity being still preserved. The spikes or teeth here employed are made of square iron, pointed and bent forward diagonally; they are fixed in such a direction, that the line of the track may pass through their angles, as in the plan represented in the plate annexed.

A patent was granted in May or June, 1801, to a Mr. WILDE, for a harrow on a new plan. His invention is intended to obviate the inconveniences attending the common harrows; from the ingenuity and simplicity of its construction, it appears to merit attention. The set of harrows, when put together for work, consists of four, which are constructed in the usual manner, and with the usual number of tines. These are placed nearly parallel to each other, and are combined by means of three iron links, which are moveable where they are joined to the harrow; the centre link is fitted in an oblique direction, and is longer than the other two, which are set straight. All the links, however, are placed loosely, in order that the implement, when joined together, may have a little *play-room*. This ingenious harrow is fastened to the *bearing-bar*, to which the traces are affixed, by means of an iron pin that is attached to the chain-hook, passing through holes made at different distances in the bar, so as exactly to give the requisite direction to the harrow. Thus, the equal course of the implement is secured; and the work is more uniformly performed, and with a greater degree of regularity.

Mr. WILDE makes harrows for *five-yard* lands, exclusive of the furrows; but they may be adapted to any size required. The horses may likewise be set to draw abreast, or where the soil is very wet and heavy, to follow each other in the furrow, and thus to prevent the land from *poaching*. The patentee is of opinion, that a considerable saving might be made both in seed and the labour of horses, three of which are said to be fully sufficient, where other harrows require four. His implement may also be employed as a rake, or for any similar purpose.

From the great importance of harrows in tillage, we have been induced to extend this article to a considerable length. Although we do not pretend to decide on the relative value and practical utility of the different inventions or improvements before specified, yet we should probably select the implements contrived by Mr. SANDILANDS; without prejudice, however, to the merits of the rest, which are doubtless calculated to be eminently useful in different soils and situations.

HARTS-HORNS, are the horns of the

common male red deer. The scrapings, or raspings, of this animal's horns are medicinal, and employed in decoctions, ptisans, or cooling drinks, &c.

Harts-horn jelly is remarkably nourishing and sometimes given in cases of diarrhœa: a decoction of burnt hartshorn in water is, however, generally substituted for this purpose.

HAT, is the name of a piece of dress worn upon the head by both sexes, but principally by the men. The use of hats seems to have been first introduced among the ecclesiastics in the 12th century, and it was not till the year 1400 that they seem to have been pretty generally adopted.

As the art of making common hats does not involve the description of any curious machinery, or any very interesting processes, we shall not enter into minute details upon the subject. It will be sufficient to convey to our readers a very general idea of the method which is employed.

The materials employed in making hats, are the fur of hares and rabbits freed from the hair, together with wool and beaver. The beaver is reserved for the finest hats. The fur is first laid upon a *hurdle* made of wood or wire, with longitudinal openings; and the operator, by means of an instrument called the *bow*, (which is a piece of elastic ash, six or seven feet long, with a catgut stretched between its two extremities, and made to vibrate by a bowstick,) makes the vibrating string strike and play upon the fir, so as to throw the fibres together, while the dust and filth descend through the chinks of the hurdle. A sieve or searce has sometimes been used for the same purpose.

After the fur is thus driven by the bow from one end of the hurdle to the other, it forms a mass called a *batt*, which is only half the quantity sufficient for a hat. The *batt* or *capade*, thus formed, is rendered compact by pressing it down with a *hardening skin*, (a piece of half tanned leather,) and the union of the fibres is increased by covering it with a cloth, and allowing the workman to press it together repeatedly with his hands. The cloth being taken off, a piece of paper, with its corners doubled in, so as to give it a triangular outline, is laid above the batt. The opposite edges of the batt are then folded over the paper, and being brought together and pressed with the hands, they form a conical cap. This cap is next laid upon another batt, ready hardened, so that the joined edges of the first batt rest upon the new batt. This new batt is folded over the other, and its edges joined by pressure as before; so that the joining of the first conical cap is opposite that of the second. This compound batt is now wrought with the hands for a considerable time upon the hurdle, being occasionally sprinkled with clear water till the hat is *basoned*, or rendered tolerably firm.

The cap is now taken to a wooden receiver, like a very flat mill-hopper, consisting of eight wooden planes, sloping gently to the centre, which contains a kettle filled with water acidulated with sulphuric acid. In this liquor the hat is occasionally dipped, and wrought by the hands, and sometimes with a roller, upon the sloping planks. The hat is thus fulled or thickened for four or five hours; knots or hard substances are picked out by the workman, and felt is added by means of a wet brush to those parts that require it. The beaver is laid on at the end of this operation, and in the case of beaver hats, the grounds of beer are added to the liquor in the kettle.

The hat is now to receive its proper shape. For this purpose the workman turns up the edge or rim to the depth of about 1½ inch, and then returns the point of the cone back again through the axis of the cap, so as to produce another inner fold of the same depth. A third fold is produced by returning the point of the cone again, and so on till the whole resembles a flat circular piece, having a number of concentric folds. In this state it is laid upon the plank, and wetted with the liquor, the workman pulls out the point with his fingers, and presses it down with his hand, turning it at the same time round on its centre upon the plank, till a flat portion, equal to the crown of the hat, is rubbed out. This flat crown is now placed upon a block and by forcing a string, called a *commander*, down the sides of the block, he forces the parts adjacent to the crown to assume a cylindrical figure. The rim now appears like a puckered appendage round the cylindrical cone; but the proper figure is now given to it by working and rubbing it.

The hat being dried, its nap is raised or loosened with a wire brush or card, and sometimes it is previously *pounced* or rubbed with pumice, to take off the coarser parts, and afterwards rubbed over with seal skin. The hat is now tied with a pack-thread upon its block, and is then dyed, by being first boiled with logwood, and afterwards immersed in a saline solution, consisting of a mixture of green copperas and blue vitriol. For a brighter dye, verdigris should be used, in place of blue vitriol.

The dyed hats are then removed to the stiffening shop. Beer grounds are now applied on the inside of the crown, for the purpose of preventing the glue from coming through; and when the beer grounds are dried, glue, (gum Senegal is sometimes used,) a little thinner than that used by carpenters, is laid with a brush on the inside of the crown, and the lower surface of the brim

The hat is now softened by exposure to steam, on the *steaming* basin, and is then brushed and ironed till it receives the proper gloss. It is then cut round at the brim by a knife fixed at the end of a gauge, which rests against the crown: The brim, however, is not cut entirely through, but it is torn off so as to leave an edging of beaver round the external rim of the hat. The crown being tied up in gause paper, which is neatly ironed down, is then ready for the last operation of lining and binding.

The art of *hat-making* has been fully detailed by Mr. Nicholson, in his *Philosophical Journal*, vol. 1, 2, and 3, 4to. to which the reader is referred.

HATCHING, is the maturation of, or communicating life to fecundated eggs, either by the incubation and warmth of the parent bird, or by artificial heat.

The art of hatching chickens by means of ovens, has been long practised in Egypt, where it is confined to the knowledge of the inhabitants of a single village and its vicinity. This method being easily understood, we shall only observe, that each brood is supposed to consist of 30,000 chickens: the number of ovens amounts to 386, which are in constant employ for six months; and, as the eggs are completely hatched in three weeks, or about the same period as a hen continues to sit upon a brood, it has been calculated that the ovens of Egypt every year communicate life to at least 92,640,000 chickens!

A very ingenious and useful method of hatching eggs, we conceive, is that invented by the celebrated naturalist Reaumur, who reduced this art to fixed principles. The degree of heat necessary for the purpose, is nearly the same as that marked 36 deg. on his own thermometer, which is equal to about 96 deg. of Fahrenheit, as well as to the heat both of the skin of the hen and all other fowl.

M. Reaumur employed stoves of any shape, which were heated by means of a baker's oven; or in a room warmed by an oven underneath: the eggs were here deposited, and occasionally shifted in a similar manner as the parent birds move them; in order that each egg might equally participate in the irregularities of the stove. The only important object is, to ascertain the precise degree of heat: with this design he melted and poured into a phial two parts of butter and one of tallow. When the heat was of a proper temperature, the liquid grease resembled a thick syrup; if it was too great, the mixture flowed like oil, on holding the phial sideward; but, when the heat was too low, it remained fixed in a lump. Thus, by placing the phial into the stove, the proper degree of heat may be easily regulated. He also invented a kind of hollow covers, or low boxes, without bottoms; and lined with fur, which he called *artificial parents*. These not only shelter the chickens when hatched, but also afford them a genial warmth, so that they fly under the boxes as readily as they resort to the protection of the wings of the hen. In a few days, they may be turned out into the open air, and committed to the care of capons, or even cocks, which may be taught to perform the maternal office, and watch them with as much solicitude as is evinced by hens. [None of those methods have been found practically useful.—T C.]

HAWK, the Common, or Sparrow-hawk, *Falco Nisus*, L. is a bold and spirited bird: it abounds in almost every part of Europe; and varieties of it are found dispersed over the whole earth.

The length of the male of these birds is twelve inches; that of the female fifteen; the former differs both in size and colour from the latter. The female builds her nest in hollow trees, high rocks, or lofty ruins, sometimes in the old nest of a crow, and generally lays four or five eggs, marked at the pointed end with reddish spots.

The sparrowhawk is obedient and docile: by keeping him awake three or four days successively in a hoop, till he become almost delirious, he may afterwards be easily trained to hunt partridges and quails. In a wild state, however, these creatures commit great depredations on pigeons, poultry, rabbits, hares, &c. so that the following method of catching them will probably be acceptable to many readers.

A hawk cage, made upon a plan similar to that of a goldfinch trap cage, but larger, and baited with two house-sparrows, should be exposed in a fine clear morning, on a hedge, or some other open place, and left out till late in the evening. By this simple contrivance, those predatory birds might be easily taken; and either destroyed, or preserved for the purposes of hawking; an amusement that has lately been abandoned, and therefore requires no description.

HAWK-MOTH, or *Sphinx*, L. is a genus of insects comprising 165 species, ten of which are discovered in Britain, and variously named, according to the trees they infest.

The generality of hawk-moths spin their cods under ground, interweaving with their threads small particles of grain and earth. They appear either early in the morning, or after sun-set: their flight is slow, and often accompanied with a peculiar sound. The caterpillars of these insects are usually found rolled up in the leaves of trees; some being green and smooth; others brown or yellow; again, others are spotted, and furnished with rings, or belts.

The most certain method of preventing the depredations of hawk-moths, consists in collecting the leaves they inhabit, and crushing the insects; after which the trees should be washed with a mixture of clear lime water, and a decoction of tobacco leaves. Such cleansing will, according to Mr. FORSYTH, also be found an effectual remedy, when the moths are in the state of larvæ; having previously picked off and destroyed the caterpillars.

HAWKWEED, or *Hieracium*, L. a native genus of perennial plants, comprising forty-six species, the principal of which are,

1. The *Pilosella*, Mouse-ear Hawkweed, which grows in dry meadows; pastures, and on walls; its flowers possess the singular property of opening in the morning, and closing early in the afternoon: they blow from May to September. This species differs from other lactescent plants, being less bitter, and more astringent, on which account it was formerly esteemed in the cure of blood-spitting. It is considered as noxious to sheep, which are not partial to it; and though eaten by goats, it is refused by horses and cows.

2. The *auricula*, Narrow-leaved Hawkweed or Umbelled Mouse-ear, thrives on mountains, in the county of Westmoreland, Eng. and flowers in the month of July. It deserves to be cultivated on the borders of gardens where bees are kept; for, according to BECHSTEIN, it furnishes them with an abundance of wax and honey.

HAWTHORN, or *Cratægus*, L. a genus of plants, consisting of twenty-five species, three of which are natives of Britain.

1. The *Aria* (*Pyrus Aria* of Dr. SMITH) White-beam Hawthorn, or Wild Pear-tree, which grows in woods and hedges, especially in mountainous situations with a calcareous soil; and flowers in the month of May. It delights in dry hills, and open exposures, thriving either in gravel or clay. It will bear lopping, and does not prevent grass from growing beneath it. The white-beam hawthorn is eaten by sheep and goats, which last animals devour it with avidity. Its fruit is red, and when mellowed by the autumnal frosts, furnishes a grateful repast; a spiritous liquor may be obtained from it by distillation. This species seldom produces a good crop of fruit for two years in succession; but its barrenness is amply compensated by the utility of its hard, tough, and smooth wood; which is formed into axle-trees, wheels, walking-sticks, carpenter's, and other tools: its seed should either be sown as soon as it becomes ripe, or preserved in damp sand.

2. The *Oxyacantha* (*Mespilus Oxyacantha* of Dr SMITH) White-thorn, or May, which grows in hedges, woods, and old parks. This is a very valuable shrub, and, on account of the stiffness of its branches, the sharpness of its thorns, and its hardiness in enduring the severest winters without injury, it is universally preferred for making fences and hedges. The berries during winter afford food to various birds, but may be more usefully employed in fattening hogs: the wood is very tough, and, like the white-beam hawthorn, converted into axle-trees and handles for tools.

There are several varieties of this species, of which we shall mention only the celebrated GLASTONBURY THORN. It is in bloom twice in the year: the winter blossoms (about the size of a sixpence) appear about Christmas, and much earlier, if the winter be very severe. These, however, produce no fruit. This extraordinrry thorn has been celebrated for its age, for nearly a whole century; the oldest inhabitants never having observed it in any other than its present state. The berries of this miraculous variety contain only one seed; and when sown, produce plants which differ in no respect from the common hawthorn.

3. The *torminalis*, Wild Service-tree, Sorb, or Service Hawthorn, which grows in woods and hedges, and flowers in the month of May. Its dark yellow berries ripen in October, and may be eaten either raw or preserved in sugar. They also yield, on fermentation, a good vinegar, as well as an ardent spirit by distilling them: where they abound, hogs may be easily fattened.

There are several native species of *Crategus* or Thorn in the United States. See HEDGE.

HAY, signifies any kind of grass, that is cut and dried for fodder.

The time of mowing grass for hay, ought to be regulated according to its growth and maturity; for it is extremely detrimental to a crop, to cut it too early; because the sap has not sufficiently circulated through the whole blade of grass; so that the latter, when made into hay, shrinks and considerably diminishes in bulk. It is, however, equally prejudicial to the grass, if it be suffered to stand till it shed its seeds. When the tops of the grass appear brown, it will then be fit for being mowed.

The chief object in making hay, is to preserve the vegetable juices.

The following description of a hay-harrow, or rake, is taken from the *Trans. Dublin Society*, having originally appeared in the works of the *Rotterdam Society*.

As the object of this contrivance is to diminish labour, Dr. MEASE thought it might prove useful to the farmers of the United States, and hence has given a full account of its merits.

If the hay, when raked by the machine, dries so rapidly as stated, in the cool moist air of Holland; the hay-rake must answer an excellent purpose in our warm dry air.

The hay-rake is of the size of a harrow. The upper and under rails are two or three inches square, and nine feet long, fastened together with three pieces, five inches broad, one inch and a quarter thick, and four feet four inches long; one in the middle, and the other two on each side, ten inches from the ends of the rails, as at *a a*. To give this machine yet more strength, there must be two diagonal braces *b b*; in each of the rails must be five teeth six inches long in the clear, and three quarters of an inch diameter, placed as in the plate, and sloping outwards to the rear; for if they slope forward, or are upright, they will cluster the grass too much in lumps. The teeth may be made of iron, and a little smaller, if the harrow sink through the hay or grass into the ground. The hay-harrow is drawn by a horse, upon which a man sits, who scatters the hay, by harrowing it from the swath, as thick as is necessary to dry it. Three acres of grass may be turned in one hour, and well mixed; and on a warm dry day, the horse may be kept constantly going; when the last of the acre is turned, the first of it may be begun with, because the grass may be sufficiently dry on the upper part, so that if this work be done at an early hour of the day, the cocks may be made up in the afternoon; because, if it should not be yet sufficiently dry, it will be so before it is all cocked.

Hay composed entirely of red clover has been proved by repeated experience to be injurious to horses when given constantly. *New* clover hay is said to hurt their eyes, and *old* clover hay to injure their wind in an evident manner. These are singular effects, and not yet well explained: but as the facts stated are the result of numerous enquiries among men the least liable to prejudice, the reader is cautioned against the injury he may sustain, from inattention, disbelief, or ignorance of these properties of clover hay. Timothy or green grass, should therefore be mixed with clover; and every species of hay should be well salted, by sprinkling a large handful of salt over the surface of every load of hay. The effect of salt in making even poor hay palatable, was stated under the head of CATTLE, vol 1. on the authority of an experienced feeder and grazier.

In erecting the stacks, great caution is necessary that the hay be not put together before it is perfectly dry; in which case it not unfrequently happens that whole stacks are suddenly reduced to ashes. To prevent such accidents, a chimney or funnel is usually made in the centre of the stack, but it then becomes necessary to form *culverts* beneath the stack, by digging three or four trenches; covering them with boards or sticks; and exposing their apertures in every direction to the wind, in order to ensure continual ventilation.

HAZEL-NUT TREE, or *Corylus*, L. a genus of plants consisting of four species: one of these is a native of Britain, namely, the *avellana*, or Common Hazel-nut tree. It grows in woods, copses, and hedges; flowers in March or April.

All the different species of the hazel are large, hardy, and deciduous shrubs; they have several varieties, valuable for their fruit, which, in a cultivated state, are known under the name of *Filberts*.

These shrubs prosper in almost any soil, or situation: and may be propagated either by layers, or by planting their nuts in February; for which purpose the latter should be preserved in sand, in a moist cellar, inaccessible to vermin; but they should not be secluded from the external air, for want of which they will become mouldy. When reared in coppices, this shrub produces abundance of underwood, that may be cut every fifth, seventh, or eighth year, according to the purpose for which it is designed.

The uses of this wood are various: it is employed for poles, hoops for barrels, spars, hurdles, handles for implements of husbandry, walking-sticks, fishing-rods, &c. Where beautiful specimens are required for veneering or staining, the roots of the hazle-nut tree are preferable to the branches. In Italy, the chips are used for fining turbid wines; and in countries where *yeast* is scarce, the twigs of this shrub, dried, and afterwards soaked in the fermenting liquor, serve as a substitute for that article in brewing. Painters and engravers prepare coals for drawing outlines, from the wood of this plant, by the following process: Pieces of dried hazel, about the thickness of a finger, and four or five inches in length, are put into a large pot filled with sand, and the top of which is closely covered with clay. In this manner they are placed in a potter's oven, or otherwise exposed to a sufficient degree of heat; and, on cooling, the sticks are found to be converted into charcoal, which draws freely, and is easily effaced with India-rubber.

According to EVELYN, no plant is better calculated for thickening copses than the hazel; with this view he recommends the following expeditious method: Take a pole of hazel (for which ash or poplar may be substituted) of 20 or 30 feet in length, the head of which is somewhat *lopped* into the ground; the pole should likewise be chopped near the soil, in order to make it yield: thus fastened to the earth with a hook or two, and covered with fresh mould sufficiently deep, it will produce an incalculable number of suckers, speedily thicken, and furnish a fine coppice.

The kernels of the fruit of the hazel-nut tree, though difficult of digestion, have a mild, farinaceous, oily taste, which is agreeable to most palates; yet *filberts* are said to be more nourishing than nuts: both, however, operate as a cathartic, when chewed small and taken in considerable quantities; but produce constipations of the bowels, if swallowed in large pieces; and dysentery, if eaten unripe. A kind of chocolate has been prepared from this fruit, which has also occasionally been converted into bread. An expressed oil is obtained from the nuts, which is little inferior to that of almonds: it is often preferably used by painters, as it readily dries; and chemists employ it as the basis of fragrant oils artificially prepared, because it easily combines with, and retains, odours. An emulsion made of the kernels, and taken with good old mead, is recommended for inveterate dry coughs. Squirrels and mice are excessively fond of the nuts; goats and horses eat the leaves, but they are refused by sheep and hogs.

HEAD-ACH, or *Cephalalgia*, a painful sensation in the head, produced by various causes, and attended with different effects, according to its various degrees, and the part of the head where it is situated.

[Head-ach, in general, is only a symptom of indigestion; for which the best remedy is a cathartic of magnesia. All acidity in the stomach produces the sick head-ach, heart-burn, &c. with pain in the back of the head or over the eye-lids. For all these take four tea-spoonfuls of magnesia in milk.—T. C.]

HEARING, is one of the external senses, and expresses the act or faculty of perceiving sounds.

HEART, a hollow muscle of a conical form, situated at the bottom of the thorax or breast: its basis is turned towards the right, and its point towards the left side. The former, whence the great blood-vessels take their origin, is covered with fat, and has two hollow appendages, called *auricles*, from their resemblance to an ear. The whole consists of two cavities, which are separated from each other by a thick muscular septum: one of these is called the *right* and the other the *left ventricle*.

The heart, which may be considered as the most powerful muscle in the animal body, serves to facilitate the motion or circulation of the blood, which is communicated to the different parts of the frame, by means of various arteries and veins. These, however, it is the province of anatomy to describe; and as that subject does not enter into our plan, we trust this brief explanation will suffice.

HEART-BURN, or *Cardialgia*, an uneasy sensation of heat in the stomach, which is frequently attended with nausea and sickness.

The heart-burn generally arises from a prevailing acidity, indigestion, the eating of tough fat meat, and unfermented mealy substances. Those persons who are subject to this affection, ought to drink no stale or acid liquors, and to abstain from flatulent food.

If indigestion, or debility of the stomach, be the cause, the patient may take moderate exercise in the open air, [and as an immediate remedy, magnesia, or common whiting.—T. C.]

HEART'S EASE, or HERB TRINITY, *Viola tricolor*, L. an indigenous annual plant, growing in corn-fields, &c. It produces generally white and yellow blossoms, intermixed with purple, which flower from May to September. This plant has almost endless varieties, and, when reared in gardens, is known under the name of *Pansies*. It was formerly in great repute for epilepsies, asthmas, &c. At present, however, it is used only in the disorder peculiar to children, called *crusta lactea*, or a species of SCALD-HEAD affecting the face. A handful of the fresh, or half a drachm of the dried leaves, is boiled in a pint of milk, and if continued to be drunk for some weeks, both in the morning and evening, it has invariably been attended with success.

HEAT, signifies either the peculiar sensation we feel on the approach of burning bodies, or the cause of that effect, which is caloric.

Heat is supposed to be a substance by the action of which fluids are evaporated, and solids are either dissipated in vapour, or rendered fluid, or converted into glass. The following observations may convey some idea of the nature and properties of this substance. An intimate connexion subsists betwixt light and heat, though it has not been hitherto discovered on what this connexion depends. Both are emitted from the sun with the same velocity nearly; both are refracted from transparent bodies, and refracted by polished surfaces; in both, the matter seems exceedingly rare, and consequently the addition, or abstraction of either, cannot sensibly affect the weight of bodies, into which they are introduced: their parts never cohere, but mutually repel each other, and when forcibly accumulated they fly off from one another in all directions. Heat, however, differs from light in this particular, viz. the latter produces in us the sensation of vision, whereas the former excites a sensation which we call by the name of the substance itself. Heat attracts other bodies, and is attracted by them. In consequence of this mutual attraction, it enters into other substances, combines with them, and occasions changes in them. For instance, it produces expansion in bodies, and increases their bulk. This property of bodies has furnished us with an instrument, called a THERMOMETER, (which see) for measuring their relative temperatures.

Heat gradually distributes itself in such a manner, that all contiguous bodies assume the same temperature. Thus, a bar of hot iron, exposed to the air, gradually cools, till it acquires the temperature of the bodies with which it is surrounded; and, on the other hand, a bar, cooled by ice, when taken into a warm room, becomes gradually hotter, till it attains the temperature of the room.

Heat penetrates all terrestrial bodies. In passing through air and several transparent substances, its motion is almost instantaneous, but through solid bodies, as iron or stone, it is remarkably slow. In the former case, heat is said to be transmitted, and in the latter to be conducted.

The greater number of solid bodies, when combined with heat, may be converted into fluids: and by the abstraction of heat the fluid again becomes a solid. Liquids, by the application of heat, may be converted into fluids, elastic fluids, invisible like air; thus, water by boiling, is converted into steam, which is water combined with a certain proportion of heat. In general, whenever a body changes its state, it either combines with heat, or separates from it.

Every body contains a certain quantity of heat, because no body is so cold that it cannot be made colder: but what quantity of heat exists in bodies has never been ascertained.

Heat may be evolved, and made sensible,—by combustion,—by percussion of hard bodies against each other,—by friction, or rubbing pieces of certain bodies, as dry wood, against one another. Light is also a source of heat, for, when coloured bodies are exposed to the light of the sun, their temperature is raised in proportion to the darkness of their colour; so that dark bodies must absorb and retain more heat, and reflect less of it, than those that are of a brighter colour.

The sensation of heat is produced by particles of heat passing into our bodies, and that of cold by heat passing out of them. We call any thing hot, when it communicates heat to bodies in its vicinity, and cold when it absorbs heat from them The strength of the sensation depends on the rapidity with which the heat enters or leaves our bodies; and this rapidity is proportional to the difference between our bodies and the hot or cold substance, and to the conducting power of that substance.

HEDGE, in agriculture, a fence inclosing a field, or garden, &c. generally made by intertwining the branches of trees.

Hedges are usually divided into two classes: 1. Outward fences, planted either with hawthorn or black-thorn, of which we have already treated under the article Fence; and, 2. Those intended for gardens, which are planted according to the fancy of the possessor, with holly, yew, or other evergreens.

In forming outside hedges, the plants ought to be as nearly as possible of the same size. The sets should be one third of an inch in diameter, freshly taken up, straight, smooth, and well rooted. The best season for planting them out, is late in the autumn; and the young hedge ought particularly to be attended to during the first two years; because, if it be then neglected, no future care can recover it. The top-shoots must not be shortened, but the sides regularly pruned for some years, while the inclosure is young: for, only by adhering to this practice the hedge will attain a proper degree of closeness and strength.

The late Mr. Bakewell was remarkably curious in his fences: he used to plant one row at the distance of a foot from set to set: and after making the ditch, to lay the earth dug out of it, so as to form a bank on the side opposite the quick. In other parts of England, the bank is made on the side of the quick above it. The advantage of Mr. B's method is, that the plants grow only in the *surface-earth*, not secluded from the atmosphere; whereas, in the common practice, the best earth is generally loaded by a thick covering of mud taken from the ditch, and placed obliquely on the bank. There is, however, a considerable waste of land in the former method: for after the whole was thus formed, he usually added a double post and rail; one on the outside of such bank, and the other on the outside of the quick.

Hedges designed for ornament in gardens, are sometimes planted with evergreens, among which the holly is preferable to any other; next in rank is the yew, but the dead colour of its leaves renders such hedges less agreeable. The laurel is another plant that may be employed as a fence for gardens; as it is one of the most beautiful evergreens; but it shoots forth with such luxuriance, that it is very difficult to confine it to any shape: its leaves, too, are very large, and, if cut through with the sheers, present a very disagreeable appearance: hence they ought to be pruned with a knife, and the shoots exactly cut down to each leaf.

The growing scarcity of wood in the United States near the capitals, renders an immediate attention to the planting of hedges absolutely necessary; and as the business is very little understood in the United States, particularly in Pennsylvania, Dr. Mease has abridged the excellent observations of Dr. Anderson on the subject, and earnestly recommends an attention to them by all American land-holders.

Dr. A. says, that a hedge of thorns thrives best in the face of a ditch. A single row is to be preferred, except on soils free from weeds. The richest and most fertile spot, must be set apart for a nursery, and in the choice of plants the youngest and most healthy, and that have their roots very much multiplied closely by the stem, are to be preferred. The plants must not be suffered to stand in the places where the seeds were originally sown, as the tap root will descend to a great depth, without sending out a sufficient number of lateral shoots near the surface, so that when it is afterwards taken up to be planted in the hedge-row, it has few or no roots that can be raised with the plant, which tends in a powerful manner to check the vegetation of the plant at the time. The plants must therefore be transplanted when young, and the roots shortened with a knife, to increase their ramifications.

Dr. A. directs to sow the haws pretty thick, transplant the strongest plants the first winter after sowing, and the remainder suffered to remain in the seed-bed one year longer; when they must be transplanted into rows at least four feet from each other, *and kept clean ever afterwards by the hand-hoe.*—Dwarf-peas or onions may be planted between the rows.

In the succeeding winter the earth between the rows ought to be dug over with the spade, taking care to go very close to the rows, and to work with a sharp edged tool, the workman always forcing the spade straight down with the back of the spade towards the thorns on each side of the row, as close to it as possible, so as to cut the greatest part of the lateral roots as near the body of the plants as possible, which will tend to make them branch into still more numerous ramifications: this operation should be repeated every winter, keeping at each digging a little greater distance from the plant; the upright shoots must not be trimmed while in the nursery.

Pick plants of an equal size, and of an equal degree of healthiness; or, sort them into several lots of different sizes, and plant each of these lots in a place by itself.

The plants should be of the size of a man's little finger, or thumb. Plants reared in a rich nursery till they are of that size, and well dug, will advance with great vigour.

The plants must be set out early in the winter, and never after February, and when planting, cut off the top of the quick entirely with a sharp tool, and prune the roots but little.

Directions for the manner of planting.—Turn up a little of the earth from the place where the ditch is to be made, and lay it upon the bank reversed, so as to form a bed for the plant about two inches thick above the solid ground, upon this the thorns should be laid nearly in an horizontal position, but inclining a little upward in the point, and having the ends of the stems just equal with the face of the bank, or projecting beyond it very little more than half an inch. By this means, every plant will send out nearly one or two shoots, which will be the more vigorous, as there are so few of them. Supernumerary shoots must be trimmed close by the stem from which they spring, for it is the largeness of these original stamina of the hedge that will afterwards constitute its strength, and not the number of small ramifications, as it is too generally imagined. An easier way still, is to rub off the supernumerary buds as soon as they begin to shoot in the spring.

The plants being thus regularly laid, should have their roots immediately covered with the best mould from the surface of the ditch, and the breast of the bank made up with the less fertile earth from the ditch.

Attention to the Hedge.

The first winter after planting, the hedge must be examined and all stinted or dead plants removed, and their places supplied. For this purpose a stock of vigorous plants must be kept in the richest part of the nursery, and be well tended; the top must be cut off at planting, and rich earth put over them.

In the course of the growth of the hedge, the top must not be cut, but only the luxuriant side branches that spring out above, trimmed from time to time, so as not to be allowed to overshade those that may be below. The first clipping must be as near to the upright stem as possible, for as these side branches must always extend a little further at every cutting, if this caution is not observed, these lateral shanks will in time become naked; and the interval would form a very disagreeable void.

A hedge that has been stinted in its growth, from the poverty of the soil, or inattention to weeds, must be cut down in autumn or the beginning of winter to the height of an inch or two above the ground, kept free from weeds, and trained as above. All the buds of the sprouting stump must be rubbed off, excepting one or two of the strongest and best placed, which should be left for a stem. An attention to this rule is of great consequence

When a hedge has been neglected, and gaps are formed, they must be filled by *plashing*. To do this, stems are selected, to be left at proper distances, the tops of which are all cut over at the height of four feet from the root. Straggling side branches of the other parts of the hedge are also lopped away.—Several of the remaining plants are then cut over close by the ground, at convenient distances; and the remaining plants are cut perhaps half through, so as to permit them to be bent to one side. They are then bent down almost to a horizontal position, and interwoven with the upright stakes, so as to retain them in that position. The operator begins at one end of the field, and proceeds regularly forward, bending all the stems in one direction, so as that the points rise above the roots of the others, till the whole wattling is completed to the same height as the uprights. All the diagonal wattlings continue to live, and send out shoots from many parts of their stems; and as the upright shoots that rise from the stumps of those plants that have been cut over, quickly rush up through the whole hedge, these serve to unite the whole into one entire mass that forms a strong, and durable fence.

Dr. A. recommends to plant in the shade, the *pyracantha*, evergreen thorn, between every second and third thorn, in order to render the hedge ornamental, also, the woodbine (honey suckles,) hardy roses, and a few plants of the crab-tree.

The willow, lombardy-poplar, and whinns or furze, and alder, are also recommended by Dr. A. to form hedges. Thus far Dr. A.

[I greatly doubt whether any hedge is so profitable as a good post and rail fence, with the bottoms of the posts well charred. The hedges near Wilmington, in Delaware, are very good.—T. C.]

HEDGE-HOG, the COMMON, or *Hystrix erinaceus*, L.

The females of these animals, after a gestation of seven weeks, produce four or five young ones, of a whitish colour, with only the points of the bristles appearing above the skin.

The URCHIN, (*Erinaceus europæus*,) a species of the hedge-hog, is a small British quadruped, the upper parts of which are covered with spines each about an inch long, and the under parts with hair.

These animals are of considerable utility in several points of view. If kept and allowed to run about in rooms that are infested with leeches, cockroaches or crickets, they will destroy the whole of them. Some persons imagine that they will devour mice, but this wants authentication. A hedgehog which was kept at the Angel Inn at Felton, Northumberland, (England,) was tamed, and employed as a turnspit, and is said to have performed this duty in every respect as well as a dog of that name. The *flesh* of this animal is occasionally used as food, and is said to be very delicate eating. The *skin*, which was frequently employed by the ancients as a clothes' brush, is now used by farmers in some parts of the continent to put on the muzzles of calves which they are about to wean, that the cow may not permit them to suck.—Several of the old writers have related accounts of very extraordinary, and at the same time very absurd, medical effects from different parts of this animal.

The places in which hedge-hogs are most commonly found are the bottoms of dry ditches, where they have shelter and concealment under bushes, fern, and grass. They sleep in the day-time, and are awake during the night, when they run abroad in search of worms, snails, insects, and other food. Few creatures can be more inoffensive.—When attacked they defend themselves by rolling into a globular form, and opposing on all sides a spinous surface. There is a notion, but it is apparently unfounded, that hedge-hogs suck the milk of cows whilst lying in the fields asleep; and that they stick fruit upon their prickles, and thus carry it off to their habitations.

HELIANTHUS, sun flower, a genus of plants containing more than twenty species, of which the most curious is the Helianthus gyrans, or moving plant, which is found in Bengal, and on the banks of the Ganges: it has a constant and voluntary motion, consisting in an alternate meeting and receding of the leaflets, a motion which does not seem to depend on any external stimulus, certainly not on the action of the sun, for they move in the dark as well as in the light, and even when the leaves are perfectly asleep. It is observable that the leaves, in the height of their erection, and during very warm weather, discover a tremulous motion.

HELLEBORE, or *Helleborus*, L. a genus of plants consisting of five species, two of which are natives of Britain: the principal of these is the *fœtidus*, Fetid Hellebore, Bear's foot, Ox heel, or Setterwort. It grows in meadows, shady places, and hedges; producing green flowers, somewhat tinged with purple at the edges, which blow in the months of March and April.

In a recent state, this species has an extremely fetid smell, accompanied with a bitter taste, which is so remarkably acrid, as to excoriate the mouth and fauces. A decoction of it is, by country people, employod as a cathartic, for which purpose one or two drachms are fully sufficient. The dried leaves of the fetid hellebore are sometimes given to children as a vermifuge; but as their operation is so violent, that a large dose might easily prove fatal, this virulent plant ought to be employed only by farriers. Beside immediate vomiting, the most proper *antidotes* to every species of the hellebore, are mucilaginous drinks in very large quantities; such as the decoctions of oatmeal, pearl-barley, linseed, marsh-mallows, &c. or milk and water; after taking which, the poisonous matter will be most effectually counteracted by diluted vinegar, juice of lemons, or other vegetable acids.

HELMINTHOLOGY, the doctrine or natural study of worms, as ornithology is that of birds, and entomology that of insects. This science embraces the five following orders, viz. 1. Intestina, consisting of worms of the most simple formation, some of which live within other animals, some in the waters, and a few in the earth. The use of many of them is obvious to us: thus the gordius perforates clay to give a passage to springs and water; the lumbricus pierces the earth that it may be benefited by the action of the air and moisture: the teredo penetrates wood, to contribute towards its destruction, so that its elements may promote the growth of vegetables: the phloas and mytillus, in like manner. penetrate rocks to effect their dissolution. 2. Mollusca, naked worms, for the most part inhabitants of the sea, illuminating by their phosphoreous power the dark abyss of the waters. 3. Testacea, or molluscous worms with calcareous habitations, or shells which they carry about with them. 4. Zoophyta, composite animals, holding a medium between animals and vegetables. 5. Infusoria, which are extremely minute animalcules, generally invisible without the aid of glasses.

HEMISPHERE, in astronomy, one half of the sphere. The equator divides the sphere into two parts, called the *northern* and the *southern* hemispheres. The horizon also divides the sphere into two parts, called the upper and lower hemispheres. Hemisphere is also used for a map or projection of half the terrestrial globe, or half the celestial sphere, on a plane. *Hemispheres* are frequently called *planispheres*.

HEMLOCK, or *Conium*, L. a genus of plants comprising five species; one of which is a native of Britain, namely, the *maculatum*, Common Hemlock; or Kex, a biennial plant, growing in hedges, orchards, rubbish, on cultivated ground and dunghills; it flowers in the months of June and July. Its stalk is more than a yard high, sometimes an inch thick, hollow, marked with many dark-red spots, and knotty; its umbels consist of numerous small white flowers, and the fruit resembles aniseed, but has an unpleasant taste. The whole plant is poisonous; though its leaves were formerly often employed in schirrous tumours of the breast, and cancers; in which painful disorder, though it may not in every case effect a cure, it is a very useful medicine, when duly prepared and administered.

As the Common Hemlock, however, is one of the most deleterious vegetables of this climate, we advise the reader to refrain from meddling with this precarious medicine, and to entrust its preparation to professional hands. If inadvertently taken, this species, as well as the two following kinds of the Hemlock, require similar antidotes and treatment with the Hellebore, of which we have treated in the preceding article.

Hemlock, the Lesser. See **Fool's Parsley**.

Hemlock, the Water, *Phellandrium*, L. a genus of plants consisting of two species, one of which, the *aquaticum*, Water Hemlock, or Horse-bane, is a native of Britain. It grows in rivers, ditches, and pools; and flowers in the month of June and July. This species is eaten by horses, sheep, and goats, but swine do not relish it, and it is totally refused by cows. It is considered as a fatal poison to horses, which on eating it become paralytic: this affection is occasioned by an insect called *curculio paraplecticus*, which is generally found within its stems; the usual antidote is the dung of pigs, which ought to be given to the animal as early as possible.

Hemlock, the Long-leaved Water, or Water Cow-bane, *Cicuta virosa*, L. is an indigenous perennial plant, growing on the sides of pools and rivers; flowering in the month of August. It is likewise one of the most virulent vegetable poisons; its root is large, hollow, and contains a very acrid milky juice that soon changes to a saffron-colour, and has a nauseous taste, somewhat similar to that of parsnip: the stem attains a height of four feet.—Early in the spring, when it grows in the water, it is frequently eaten by cows, which are inevitably killed by it; but, as the summer advances, its scent becomes stronger, and they carefully avoid it. Yet, though it is thus fatal to cows, it is eaten with safety by horses, sheep, and goats, which last devour it with avidity.

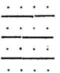
Two species of Cicuta are natives of the United States, viz. *C. bulbifera*, with white flowers, and *C. maculata* with a purple spotted stem, and black flowers. They are highly poisonous.

Hemlock Spruce. See Pinus.

HEMP, the Common, or *Cannabis sativa*, L a valuable plant, which grows wild in the East Indies, and is cultivated to a very considerable extent in Britain, particularly in the counties of Sussex and Suffolk. It thrives most favourably on a sandy, moist loam, or on old meadows and low bottoms near rivers; and is propagated from seed, which is sown in the proportion of eleven pecks, or two bushels per acre, broad-cast; though a much smaller quantity will suffice, if it be drilled.—The proper time for sowing hemp, is from the middle to the end of April, or even a month later; but the best crops are generally produced from the earlier seeds.

This useful plant requires no weeding; the male, or *fimble* hemp, is usually fit for pulling in the middle of July, or about nine weeks after it is sown. The female, termed *harle*, or seed-hemp, is seldom ripe till September, when it is *pulled*, tied into bundles, and set to dry: at the end of ten days they are loosened, and the heads or tops are held upon a hurdle by one person, while another, with a small threshing flail, beats out the seed.

The hemp is then prepared for the manufacturer, either by *grassing*, that is, lying on stubble or pasture ground, in order to be gradually *dew-ripened*, or, by *water-rotting*, for which process clay-pits are preferred to running-water. In these, the hemp is immersed in bundles, laid both directly, and across, thus,



for four or five days, according to the fineness of the weather. The next operation is that of *reeding*, namely, the separation of the bark from the *reed*, or woody part, which is effected either by pulling out the reed with the hand, or by drying, and breaking it by machinery, like flax. The hemp is then cleared of its mucilaginous matter, by pouring water through it, and squeezing out the liquid after every affusion, till it be completely divested of those particles.

The next operation is that of *breaking* it, which, in the county of Suffolk, is performed with the aid of certain machinery worked by the hand; when the hemp is beaten in mills; combed or dressed by drawing it through *heckles*, similar to the combs of wool-manufacturers; and spun into thread, whence it is made into twine, cordage, cloth, netting, &c.

Beside the strong cloth, and other articles made from it, hemp is of considerable utility for other purposes.—The refuse, called *hemp sheaves*, affords an excellent fuel; and the seeds yield by expression a pure oil, which is peculiarly adapted for burning in chambers, as it is perfectly limpid, and possesses no smell. Another valuable property of hemp is, that it effectually expels vermin from plantations of cabbages; for, if it be sown on the borders of fields, &c. planted with that vegetable, no caterpillars will infest it.

When fresh, hemp has a strong, narcotic smell: the water in which it has been soaked, is said to be in a high degree poisonous, and to produce fatal effects, immediately after drinking it.

In the Eastern climates, hemp-leaves are used like opium, and possess similar intoxicating properties. The Russians and Poles, even of the higher classes, bruise or roast the seeds, mix them with salt, and eat them on bread. Birds, kept in cages, are likewise fond of this oily seed; but they should not be indulged in its constant use, which is apt to render them prematurely old, blind, and at length consumptive.

Hemp being an article of extensive utility, various vegetables have been discovered, which may serve as substitutes. Among these are the Canada Golden-rod, or *Solidago Canadensis*, a perennial plant, that might be easily cultivated in Britain: its stalks are numerous, straight, and grow above five feet in height; they afford very strong fibres, if treated in the same manner as hemp. The sun-flower, or *Helianthus*, L. also affords single filaments or fibres, which are said to be as thick, and in all respects as strong, as small pack-thread. See also Nettle.

The following additional account may be acceptable:

Hemp, or *cannabis*, a plant, of the diœcia class, well known for its use in the manufacture of cordage and cloths. The usual height of the plant is from five to six feet; but that which is cultivated near Brischwiller in Alsace, is sometimes more than twelve; its circumference three inches. It may be planted upon any land; the poorer producing that which is fine in quality, though small in quantity; and the richer and stronger, that which is abundant in the former, but coarser in the latter. Besides its uses in manufactures, hemp is said to recommend itself to the agriculturist, by driving away almost all the insects that feed upon other vegetables. Hence, in some parts of Europe, a belt of this plant is sown round gardens, or other spots, to preserve them. Hemp is known to be ripe, by the inclination of its stems to a yellow colour. This is about thirteen weeks after its sowing. After being pulled, and free from its leaves, seeds, and lateral branches, which is done by dressing with a ripple or wooden sword, it is made up into bundles to be steeped in water. The steeping, or *water-retting*, is to promote the separation of the bark, which is properly the *hemp*, from the reed, or ligneous part of the plant. The same end is sometimes attained by *dew-retting*, or exposing the stalks to the air; but the former method is generally thought preferable. The process of M. Bralle, is, to boil the hemp in caldrons for an hour, with about 4 ounces of soft soap to the cwt. of hemp, in lieu of rotting.

When the hemp is thoroughly retted, which is usually at the end of four, five, or six days, the operation of *reeding*, or completing the disengagement of the bark and woody part of the plant, commences. This is done in one of two ways; either dyeing and breaking the plant, or pulling out the reed from every stalk with the hand.

When reeded, the *hemp* must be cleansed of the glutinous matter with which it is its nature to abound. This is done by pouring water through it, and pressing out the water after affusion; care being taken not to let the threads twist or entangle each other, which they are apt to do. *Hemp* is broken by machinery; after which, it is beat. This labour was formerly performed entirely by hand; but, at present, a water-mill, which raises three heavy beaters that fall alternately, is almost universally used. While the mill is at work, a boy turns the hemp, that all parts of it may receive the strokes. The finer it is required to make the tow, the more beating is necessary.

The tow, being first dressed or combed, is sold to the spinners, who reel the yarn as follows:

2 yards make	1 thread	2 yards
40 threads	1 lea	30
20 leas	1 skein	1600
3 skeins	1 clue	4800

From the spinners it passes to the bleachers, who receive twenty or twenty-one clues for every one hundred and twenty bleached.

Only the coarser kinds of hemp are employed in making cordage; the finer being used for cloth, which though incapable of receiving the delicacy of linen, is incomparably stronger, equally susceptible of bleaching, and possessed of the property of improving its colour by wear.

Hemp is of great importance in maritime affairs; it therefore forms a considerable article of commerce. The cordage and sails of a first-rate ship of war are said to consume 180,000 lb. of rough hemp. In the year 1788, the quantity imported into England was 58,464 tons: which at 20*l*. per ton, amounted to 1,269,280*l*. and which at an average product of one-fifth of a ton per acre, required 292,320 acres for its growth.

Hemp, *Chinese*, a species of hemp superior to the common; but which has not yet been cultivated otherwise than in the way of experiment.

HEN, the female of the Cock, (*Phasianus Gallus*), an useful domestic bird which lays eggs, and produces one, and sometimes two broods of chickens in one year.

If well fed, and allowed to roam in a farm-yard, a good hen will deposit, in the course of twelve months, above 200 eggs. She prepares her nest without any care, either among bushes, or by scratching a hole in the ground; the time of hatching is preceded by a clucking noise, and the animal's discontinuing to lay eggs. Ten or twelve chickens being the greatest number that a good hen can rear and clutch at a time, various methods have been devised for obtaining young broods by artificial means, of which we have already treated under the article Hatching.

Capons may easily be taught to clutch a fresh brood of chickens: First, the fowl is made so tame, as to feed from the hand; on the approach of the evening, the feathers are plucked off his breast; the bare skin is rubbed with nettles; and the chickens are then placed beneath him. This expedient is repeated two or three nights in succession, till the animal conceives an affection for the young birds thus committed to his charge: when one brood is grown up, another nearly hatched may be placed under him, in the manner above directed; and he will treat them with the same tenderness as the real parent.

HEN-BANE, or *Hyoscyamus*, L. a genus of plants comprising nine species, one of which is a native of Britain, namely, the *niger*, or common Henbane. It abounds in villages, road-sides, and among rubbish; and flowers in the month of July. Neither horses, cows, swine, nor sheep, will touch this plant, though the animals last mentioned are supposed to eat it when young:—it is not relished by goats.

The seeds, leaves, and roots of the common hen-bane, taken internally, are reputed to be poisonous: and numerous instances have been recorded of their virulent effects. The general consequences of eating them are, convulsions, madness, and death; though Dr. SMITH states that he has eaten the *seeds* with impunity. The leaves, if scattered about a house, are said to drive away mice and rats: when bruised, they emit an odour resembling that of tobacco: and are so powerfully narcotic, that their exhalation occasions the head-ach and giddiness. The whole plant is fatal to poultry: it intoxicates hogs; but cows, horses, dogs, and goats, are able to bear a tolerable portion before they are affected.

Notwithstanding these virulent properties, the hen-bane has lately been employed with considerable success in the most obstinate diseases, such as epilepsy, internal spasms, madness and melancholy; though we trust that no circumspect person will ever resort to its use, without consulting a medical friend. If, however, any small portion of the leaves should have been accidentally swallowed, brisk emetics ought to be instantly taken; and after discharging the contents of the stomach, it will be necessary to administer emollient and oily clysters, to repeat them as often as they are ejected, and to drink as large portions of vinegar or juice of lemons diluted with water, as the stomach is able to support.

HEN-HARRIER, DOVE-COLOURED FALCON, or BLUE HAWK, *Falco Cyaneus*, L. a bird, found chiefly in the northern parts of Britain. It is about 18 inches in length; the female breeds annually on the Cheviot Hills, and other precipices in that neighbourhood; and makes her nest on the ground, where she deposits four eggs.

The hen-harrier flies low, skimming along the surface of the earth in search of its prey, consisting of lizards, reptiles, and birds; especially poultry; among which it commits great depredations.

HEPATIC ALOE, the inspissated juice of the common aloe, a native of Barbadoes, and other West India islands. Its smell is much stronger, and more disagreeable, than the Socotrine aloes; the taste is uncommonly bitter and nauseous. The best hepatic aloe comes from the island of Barbadoes, in large gourd-shells: an inferior sort, which is in general soft and clammy, is imported in casks. For an account of its medicinal properties, see ALOE.

HEP-TREE. See DOG-ROSE.

HERB, a name given to all plants, the stalks or stems of which perish every year, after their seeds have attained to maturity.

Herbs are usually divided into two classes: 1. Those, the roots of which decay together with the stem; and, 2. Those, whose roots vegetate in the ground for several years.

The former class is subdivided into 1. *Annuals*, or those plants which arrive at maturity the first year, and entirely perish, immediately after they have shed their seeds; such are wheat, rye, barley, &c. 2. *Biennials*; and 3. *Triennials*; namely, such as yield fruits and flowers the second or third year, and then decay: of this nature is the Garden Angelica, and some other plants.

Those herbs which do not decay after they have shed their seeds, belong to the latter class, and are called *perennials*; some of them lose their verdure, and continue bare during part of the year, such as colt's-foot, &c. while others retain their leaves the whole year, whence they are called *evergreens*; such are the holly, fir, &c.

Herbaceous Plants are such as are furnished with succulent stems, or stalks, creeping along the ground every year. They are divided into similar classes with herbs, and those which merit more particular notice, are treated of in their alphabetical series.

HERBAL (*Herbarium*), generally speaking, signifies a book, containing a methodical arrangement of the classes, genera, species, and varieties of plants, together with an account of their properties. It is also applied to a *hortus siccus*, or dry garden: an appellation given to a collection of specimens of plants carefully dried and preserved.

Among the different methods adopted by botanists, for obtaining a *hortus siccus*, the following appear to be the most practicable:

1. Lay the plants flat between papers; then place them between two smooth plates of iron screwed together at the corners: in this state they are to be committed to a baker's oven for two hours. After being taken out, they must be rubbed over with a mixture consisting of equal parts of brandy and aquafortis, then pasted down on paper with a solution of gum-tragacanth in water, after which they are to be laid in a book, where they will adhere, and retain their original freshness. Although this process was suggested by Sir R. SOUTHWELL, in the 237th Number of the *Philos. Trans. of the Roy. Soc.* yet the following method is more simple:

2. Flatten the plant, by passing a common smoothing iron over the papers between which it is placed; and dry it slowly in a sand-heat. For this purpose, the cold sand ought to be spread evenly, the smoothened plant laid gently on it, and sand sifted over so as to form a thick bed; the fire is then to be kindled, and the whole process carefully watched, till the plant is gradually and perfectly dried. Thus, the colour of the tenderest herb may be preserved, and the most delicate flowers retain all their pristine beauty.

3. Another, and far more complete method, was suggested by the ingenious Mr. WHATELY; and bears a slight resemblance to that last specified. He directs those who intend to follow his plan, previously to procure. 1. A strong oak-box of the same size and shape as those employed for packing up tin plates: 2. A quantity of fine sifted sand, sufficient to fill the box: 3. A considerable number of pieces of pliant paper from one to four inches square; and, 4. Some small flat leaden weights, and a few small, bound books.

He then directs the specimen of the plant intended for the herbal to be gathered, when dry and in full bloom, with all its parts as perfect as possible, and conveyed home in a tin box, well secluded from the air. The plant is first to be cleared from the soil as well as the decayed leaves, and then laid on the inside of one of the leaves of a sheet of common cap-paper. The upper leaves and flowers are next to be covered, when expanded, by pieces of the prepared paper, and one or two of the leaden weights placed on them. The remainder of the plant is now to be treated in a similar manner.

The weights ought next to be gently removed, and the other leaf of the sheet of paper folded over the opposite one, so as to contain the loose pieces of paper and plants between them. A book or two is now to be applied to the outside of the paper, till the intended number of plants is thus prepared; when a box is to be filled with sand to the depth of an inch, one of the plants put in, and covered with sand sufficient to prevent the form of the plant from varying. The other plants may then be placed in succession, and likewise covered with a layer of sand, one inch thick between each; after which the whole is to be gently pressed down in a greater or less degree, according to the tenderness or firmness of the plants.

The box is next to be carefully placed before a fire, one side being occasionally a little raised, as may be most convenient; the sides being alternately presented to the fire, two or three times in the day; or, the whole may be put into an oven gently heated. In the course of two or three days, the plants will be perfectly dry, when the sand ought to be taken out, and put into another box: the plants should likewise be removed to a sheet of writing paper.

This method of preserving plants, Mr. WHATELY states to be preferable to every other, as both the flowers and leaves, if kept loosely within the paper, in a dry room, without being exposed to the air, will retain their beauty for several years. It will, however, be necessary to inspect them once in the course of a year, for the purpose of destroying any small insects, that may accidentally breed among the plants.

HERB-PARIS, or TRUE-LOVE, ONE-BERRY, or FOUR-LEAVED TRUE LOVE, *Paris quadrifolia*, L. an indigenous plant, growing in woods and shady places; and flowering in the month of May or June.

The dark, brown berries of this plant, possesss a narcotic smell, and are fatal to poultry. If inadvertently eaten by children or adults, they occasion vomiting and spasms in the stomach. The expressed juice of the berries, however, is said to be useful in inflammations of the eyes; and both the leaves and berries possess similar properties with opium. According to LINNÆUS, the root of the Herb-Paris may be employed as a substitute for Ipecacuanha; for it excites vomiting, if given in a double proportion. BOHMER remarks, that the dried leaves impart a fine yellow colour to yarn or linen-cloth, which has been prepared in alum water.

HERB-ROBERT, or FETID CRANE'S-BILL, *Geranium Robertianum* L. an indigenous annual plant, growing on walls, hedges, rubbish, and stony places; flowering from May to October. This herb is in great repute among many farmers, for its efficacy against the staling of blood, and the bloody flux in cattle; in which cases it is said to be preferable to most of the remedies used on such occasions.

In Germany, the Herb-Robert is employed in the process of tanning; and DAMBOURNEY obtained from this, as well as all the other species of Geranium, a more or less durable yellow dye.

HERON, the COMMON, or *Ardea major*, L. a predatory bird, which has a small lean body, but is provided with long legs, and a sharp-pointed bill.

The male heron is a very elegant bird; its forehead, crown, and upper part of the neck, are white; the head is adorned with a pendent crest of long black feathers; beneath the covers of the wings it also has a fine black plumage. The female, however, is not so handsome; she builds her nest either in trees, or in high cliffs over the sea, and forms it of sticks lined with wool: in the month of February, she deposits five or six large eggs of a pale green colour.

Herons were formerly much esteemed as a delicacy at the table. but their flesh has a strong taste of fish. They attain an age sometimes exceeding sixty years, and are very great devourers of fish, so that they occasion more mischief in a pond than otters. One heron will swallow fifty dace or roaches of a moderate size in a day, and it has been known to devour a thousand store-carp in a year.

HERRING, or *Clupea harengus*, L. is a small fish distinguished by its sharp and serrated belly, the body being without spots, the lower jaw longer than the upper, and the dorsal fin so exactly situated above the centre of gravity that when taken up by it the fish will hang in equilibrio.

These fish, which are in general from eight to ten inches in length, are migratory, and found at particular periods, in immense shoals, in nearly all parts of the Northern Ocean.

So great is the supply of herrings, and such the general esteem in which they are held, that they have almost equal admission to the tables of the poor and the rich. They have been known and admired from the remotest periods of antiquity; but, as our ancestors were ignorant of the means by which they could be preserved from corruption, they were not so profitable to them as they are to us.

The herring fishery in different parts of the world affords occupation and support to a great number of people. In Holland it has been calculated that formerly more than 150,000 persons were employed in catching, pickling, drying, and trading in herrings; and on the different coasts of Great Britain, many thousands of families are entirely supported by this fishery. The principal of the British herring fisheries are off the coasts of Scotland and Norfolk; and the implements that are used in catching the fish are nets stretched in the water, one side of which is kept from sinking by buoys fixed to them at proper distances, and the other hangs down by the weight of lead which is placed along its bottom. The herrings are caught in the meshes of the nets as they endeavour to pass through, and, unable to liberate themselves, they continue there until the nets are hawled in and they are taken out.

Herrings are in full roe about the month of June, and continue in perfection until the commencement of winter, when they begin to deposit their spawn.

The art of pickling these fish is said to have been first discovered towards the end of the fourteenth century by GUILLAUME BEUCHEL, a native of Brabant. The emperor CHARLES V., about 150 years afterwards, honoured this benefactor of the human race by visiting the place of his interment, and eating a herring on his grave.

Yarmouth in Norfolk is the great and ancient mart of herrings in Great Britain. The season for catching them commences about Michaelmas, and lasts during the whole month of October; and more than 60,000 barrels are generally cured in the neighbourhood of that town every year. Some of these are *pickled*, and others dried. In the preparation of the latter (which have the name of *red herrings*) the fish are soaked for twenty-four hours in brine, and then taken out, strung by the head on little wooden spits, and hung in a chimney formed to receive them. After this a fire of brushwood, which yields much smoke but no flame, is kindled beneath, and they are suffered to remain until they are sufficiently dried, when they are packed in barrels for exportation and sale.

It will afford some idea of the astonishing supply of these invaluable fish, when it is stated that, about seventy years ago, nearly 400,000 barrels of herrings were annually exported from different parts of the coast of Norway; that previously to the late war about 300,000 barrels were annually cured by the Dutch fishermen; and that a considerably greater quantity than this is obtained on the coasts of Great Britain and Ireland.

There is in some countries a considerable trade in the *oil* which is obtained from herrings in the process of curing them. The average annual quantity of this oil exported from Sweden is about 60,000 barrels.

The IMMENSE WEALTH which the Dutch derive from the herring fishery is well known to every person who has paid attention to the subject of the wealth of nations, or is acquainted with the history of the above mentioned people. This fishery has been emphatically styled the *Dutch Gold Mine*, and such indeed it has proved to them. The coasts of the United States are annually visited by herrings, and though not of the same quality as those caught by the Dutch, yet there can be no doubt of the possibility of improving their natural good qualities, by the same attention which is paid by the Dutch. That it is to the mode of curing, more than to the original flavour of the fish, the peculiar excellence of the Dutch herrings is owing, is proved by this fact, viz. that the English do not prepare herrings of equal quality with the Dutch, though the fish are caught on the same coast: viz. on that of Scotland.

A conviction of the importance of this trade to the United States, induced Dr. MEASE to take pains to investigate the subject, and to abridge the scarce and valuable pamphlet published by the patriotic *Earl of Dundonald*, who has detailed the Dutch regulations, and the mode of procedure; and Dr. MEASE considered himself as rendering an essential service to his country by so doing.

"The Dutch oblige the fishermen, by law, to separate the herrings caught in one night from those caught in another, and to take them off Fair Hall, or Scotch coast, after St. John's day (June 24). No herrings are allowed to be shipped after the 15th of July. The herrings first taken are not to be sold, unless they have been ten days in pickle. The curing of the herrings must be completed three weeks after they arrive, and be repacked more than once, according to the nature of the herring. No herrings are suffered to be repacked or heightened with fresh pickle, but in the public streets, or customary places, with open doors. The different sorts and sizes of herrings must be kept separate, and the large barrel herrings to be salted in no less proportion than *four barrels of salt to every last* (12 barrels); the herrings to be properly gutted, and laid cross wise in the barrel. *They prohibit all salt being used except that from Portugal or Spain.* (St. Ubes.)

The gills, liver, and stomach are the only parts that are torn away. The long gut, to which a fat membrane adheres, is drawn a little out of the body of the fish, and is left pendent. As soon as gutted, the fish should be salted with the above quantity of Spain or Portugal, or best purified salt, and laid close in the barrel, in a *direction contrary to the one immediately below*. When the barrel is full, it is to be coopered up, and stowed in the hold. The barrels should be tight. Fourteen days is sufficient for the fish to pine in the first salt or pickle, provided the salt be *small;* but when great salt is used, it may require three weeks or a month.

The *Curing* of herrings is a distinct process from that of salting, and is necessary to prevent the tendency which the bloody liquor or brine has to putrify, and consequently to spoil the fish.

CURING. After the herrings have been salted as directed, and have remained a sufficient time in salt to pine, or throw their liquor, empty the barrels containing the herrings upon a large dresser, with a ledge or moulding round it, and inclined one way, to allow the brine to run into a hogshead or vessel placed to receive it: put the brine into a large hammered iron pan, or cast metal boiler, let it boil, skim it, draw off the liquor, and when skimmed into a wooden vessel, let it cool.

Take the milts of thirty herrings for every barrel proposed to be cured; bruise them in a mortar, add of the liquor as you proceed, and when sufficiently dissolved; and in the state of a rich emulsion or saponaceous liquor, mix it with the boiling liquor in the wooden vessel; then lay the herrings in the barrel; with a layer of salt betwixt each row, in the same manner as directed in the salting of them: cooper up the barrels, and fill them with the prepared liquor at the bung hole, or at the hole in the end of the barrel."

The causes to which the superiority of the Dutch herrings are attributed by the Rev Herbert Marsh are as follow. See *Dublin Soc. Trans.* vol. 1, part 2d.

1. The attention to the proper quantity of salt so as neither to render the fish too salt, nor to endanger their spoiling, from using too small a quantity.

2. To the quality of the salt employed.

3. To the sorting of herrings before they are salted the second time, by the fish wardens after they are brought into port.

4. To the mode of treating them when first taken. They are never exposed uncovered to the open air: but when drawn out they are thrown into pickle, and then gutted, salted and packed, and if any remain when they shoot the nets again, they cast that remnant overboard as unfit for use: hence arises that uniform equality observed in the Dutch herrings.

HESSIAN FLY. See Fly, the Corn, and Wheat.

HICCOUGH, or Hiccup (*Singultus*), a sudden convulsive motion of the stomach, occasioned by various causes, such as a fit of laughing, thirst, cold drinks, suppression of diarrhœa, antipathy, &c. It can by no means be considered as a disease, though a few instances have occurred, in which it has continued for three or four years; and one in which it became habitual, and could not be removed.

Persons who eat large meals, and load the stomach by drinking profusely after them, or those liable to flatulency, are chiefly subject to this affection.

The common hiccough seldom requires any medicine to remove it, as it generally disappears after drinking a few small draughts of water in quick succession; or taking slowly a little sugar.

HICKORY, a well known native forest tree of the United States of the genus *Juglans*, L. Marshall, in his "*Arbustrum Americanum*" enumerates the following varieties of this species.

"1. *Juglans alba acuminata*, long sharp fruited hickory tree. The kernel of the nut is small and not sweet.

2. *J. alba minima*, white, or pignut hickory. The fruit of which is small and round, and covered with a very thin husk, or covering, opening in divisions. The shell of the nut is also thin, and the kernel plump, but very bitter. The timber of this is not much esteemed. The late Dr. John Pennington recommends the pignut as an astringent.

3. *J alba odorata*. The nuts are small, round, and the kernel sweet. The timber is hard and tough, and used for axle trees for carriages, mill cogs and rounds; and also for handles, &c. for most implements of husbandry.

4. *J. alba ovata*. Shell barked hickory. This tree delights in a moist rich soil. The fruit is roundish, but rather flatted, and indented at the ends. The shell is thin, and contains a highly pleasant kernel, preferable to the other kinds. There are several varieties of this in America, some with nuts as large as our common walnut."

These should be carefully preserved, as they yield, together with the hickory nut, a very fine oil, which has been expressed from the bruised nuts, and found superior to the olive oil for table use.

HIDE, generally speaking, signifies the skin of beasts, but is particularly applied to those of large cattle, such as bullocks, cows, horses, &c.

Hides are either raw or green, that is, in the same state as when they were taken off the carcass; salted or seasoned, in which case, they are dressed with salt, alum, and salt-petre, to prevent them from putrifying; or they are curried or tanned; for an account of which process, the reader will consult the articles Currying and Tanning.

In August 1783, a patent was granted to Mr. Geo. Choumert, of Five-foot-lane, Bermondsey-street, Surrey, tanner, for his invention of a machine for cutting, splitting, and dividing hides and skins, both in the *pelt*, and after being dressed into leather, from separating the grain from the flesh-side. As, however, this patent, though expired, cannot be understood without a plate, and is, besides, not immediately connected with domestic economy, we refer the inquisitive reader to the 4th vol. of the *Repertory of Arts and Manufactures*.

Another patent was granted in May, 1801, to Mr. Thos. Bagnall, of Worsley, Lancashire, for a mill or machine for beaming or working green hides and skins out of the mastering or drench, and preparing them for the ouse or back liquor, and also for chopping, grinding, riddling, and pounding bark, and for other purposes. This machine may be worked by wind, water, steam, or any other power; but for the reasons before stated, we again refer the curious reader to the 15th vol. of the work above cited.

HIDE-BOUND, in farriery, a disorder to which horses, or other cattle, are subject. It is known by the rigidity of the skin, which apparently adheres to the animal's ribs, without the least partial separation. The horse is generally languid, dull, heavy, and weak; his excrements are dark, foul, and offensive; he falls into profuse sweats on every little exertion; and his whole appearance indicates great weakness.

Want of proper care, and bad food, such as rank long grass in swampy situations and musty hay or oats, are the most probable causes of this affection. Few directions, therefore, will suffice, as the case is rather a temporary inconvenience than a disease. The animal should lose a little blood, or take two or three purges in the course of a week, and be fed on warm mashes.

HIDE-BOUND, is likewise an appellation given by husbandmen to those trees, the bark of which adheres too closely to the wood, and obstructs their growth. The most simple remedy that suggests itself on the occasion, is, to cleanse the bark properly with a brush, dipped in soap, and make slight incisions, longitudinally, round the whole stem; yet this operation will be most advantageously performed in the vernal months, or early in the summer. See APPLES.

HIPPOPOTAMUS, or RIVER-HORSE, *Hippopotamus amphibius*, is an African quadruped of immense bulk, with large head, extremely wide mouth, strong teeth, and thick and short legs, each terminated by four hoofs.

The body is of brownish colour, and covered with short and thinly set hair. One of these animals, which M. LE VAILLANT killed in the south of Africa, measured nearly eleven feet in length, and about nine feet in circumference.

In the immediate neighbourhood of rivers in several parts of Africa, even as far south as the Cape of Good Hope, the hippopotamus is occasionally seen. Notwithstanding his bulk and strength, he is an animal of considerable timidity, and whenever he is surprised, he plunges into the water, and walks about at the bottom with great ease, rising to the surface about once every ten minutes to breathe. He feeds on plants of various kinds, and sometimes proves very destructive in the plantations, not only by the quantity of food which he actually devours, but also by his treading down and crushing with his feet much more than he eats.

He is never offensive unless when accidentally provoked or wounded, but when his anger is roused, revenge is fully within his power, for he can dash a boat to pieces with his teeth, or if the river be not deep he will raise one on his back and overset it. The Egyptians are said to destroy the animal with the following artifice; they scatter a vast quantity of peas in his track, which he eagerly swallows whole, the dryness of the food disposes him to drink, the peas swell in his stomach and kill him.

The hippopotamus is one of those animals whose tusks are used as ivory; and from their always preserving their original whiteness, and purity, they are considered even superior to the tusks of the elephant. They are from twelve to fourteen inches in length, and weigh from six to ten pounds each. Dentists sometimes manufacture them into artificial teeth, for which they are well adapted. Of the hide, which in some parts is nearly two inches thick, the inhabitants of Africa make excellent whips, which after a little use become very pliable. The flesh, when the animals are in good condition, is said to be tender and well flavoured, particularly that of the parts near the breast. It is even sometimes admitted to the tables of the colonists at the Cape of Good Hope. The Hottentots consider it so great a delicacy that they will eat it even in a half putrid state. Professor THUNBERG states that he one day passed a Hottentot's tent which had been pitched for the purpose of consuming the body of an hippopotamus that had been killed some time before. He says that the inhabitants of the tent were in the midst of such stench, that the travellers could hardly pass them without being suffocated. The feet are considered peculiarly fine eating; and the tongue, when salted and dried, is in great esteem at the cape.

HIRUNDO, the swallow in natural history, a genus of birds of the order passeres, of which there are 38 species. Of all the feathered tribes, that of the swallow kind is most on the wing—Flight seems its natural, and almost necessary attitude. In that state it feeds, and bathes itself, and sometimes procreates and nourishes its young.—Their wings are long and adapted for continued flight, and their tails are large and forked, to enable them to turn with agility, and to be masters of their flight even in its greatest velocity. The nidification of this tribe is a curious part of their economy. It is wonderful to observe with what degrees of architectural skill, Providence has endued birds of the same genus, and nearly correspondent in their modes of life.—While the swallow and the house martin discover the greatest address in raising, and securely fixing, crusts of loam, of which their nests are formed, the bank-martin makes his hole in the sand, which is serpentine, horizontal, and two feet deep. The nests of the Hirundo esculenta, or esculent swallow, are reckoned a most exquisite delicacy among the Chinese, who make them into soups and use them in their most delicate dishes.

HISTORY, in its general sense, consists of all that kind of knowledge which belongs to narrative; and stands opposed to science, which is demonstrated knowledge, and to philosophy, which is matter of opinion. Literally, this word is applicable only to that information which the writer gives on his own knowledge. Those who write *histories* of things or events which they have not themselves seen, are mere compilers of the testimonies published by others.

History, then, denotes narration and description of every kind; but, as preeminent, the narrative of human affairs is styled *history* absolutely, while narratives, or descriptions, of other objects, are distinguished by specific additions; as *natural history*, the description of nature, and narrative of its events. With regard to human affairs, also, the application of the term *history* is still farther restricted to the narrative of political occurrences only. To entitle the account of the transactions of the government, the wars and the negotiations of a nation, its *political history*, would be thought a pedantic refinement; and to call that of its ecclesiastical occurrences, or domestic manners, by the general term *history*, would be censured as wanting in precision.

If the reader, as may probably happen, is indifferent to this literary question, the subject is nevertheless of importance to him, in another point of view. It is incalculable to what an extent the ideas of mankind are misled, by the simple circumstance of taking that which is *political history*, in the same sense with *general history*. Readers frequently complain that *history* is full of nothing but wars and political machinations; but they should reflect these are the very subjects of which *history* (commonly so called) proposes to treat: years of peace are but so many blanks, over which the historian passes with a dash of his pen, and often a sneer of contempt; while a single day of trouble, or a plot, or a rumour of a plot, is a theme for many a volume.

II. History is naturally interesting in the highest degree; we cannot but take the most lively concern in the transactions of our fellow creatures; and, if time be measured by the succession of ideas, this study certainly antedates our lives, and makes us live through the ages that have preceded our birth. Nor is the importance of history inferior to its fascinations; it is the source, immediate or mediate, of almost all our ideas. No man who is acquainted with facts, can form a theory without taking these into the account; we seldom speak or think of human nature, without some reference to the actions which we believe mankind to have performed; and, are not the attributes, nay, the very conduct, of the Deity himself, daily argued on historical ground?

III. To those who are desirous of studying history with advantage, it is always recommended to make geography a correlative pursuit; and farther, to have at hand, a map of the country, the history of which they are reading. The learner cannot be too sedulous, also, to reduce the medley of events into order; and to form, in his mind, an accurate abridgment of the narrative. It is not here recommended to commit any such abridgment to paper (for, in that case, it will presently be forgotten, and the student's knowledge be to be found, not in his head, but in his escritoir;) nor, ought historical reading to be confined to that of the abridgments of others: these have their use; but we cannot know too many particulars: it will often happen, that some unnoticed circumstance overturns, in the mind of a man who thinks for himself, all the specious fabric that partial historians have set up.

IV. The latter consideration will properly introduce a few remarks, of the justice of which, and of many others of a similar nature, it is infinitely desitable that the historical inquirer should be convinced. Historians are commonly partisans or poets, or, perhaps, it should be said, both; and the generality of histories are written with nearly all the license of romance. Their readers, therefore, should be incessantly on their guard against the fallacies attempted to be imposed upon them by prejudice, or by imagination. In this high, but intricate and perplexing, concern, two rules of judgment, that can seldom be useless, present themselves: firstly, it will be well to analyse the particulars recited in a smooth composition, and observe whether they are all of that nature which admit of complete evidence? whether, no artificial turn be given by a presumptuous use of epithets, or barefaced interpolations? and, whether the whole is, or is not, at the mercy of a writer, who obtrudes his own notions at every step, and talks of weak kings, and wicked ministers, or stubborn princes and servile courtiers, instead of detailing facts from which the reader may judge for himself?

Secondly, if the student be young in the research, he cannot too strongly bear in mind the uncertainty of all historical information. Neither understanding nor honesty are always securities for the veracity of the writer. It were endless to recount the forms in which error forces itself upon him whose record is built upon the authority of others; and there are many occasions on which even the personal evidence of the historian ought to command but little of implicit belief.

Among the numerous causes of historical falsehood, of which it would be useful to take the most scrutinising view, there is one which appears eminently deserving of remark; and this is, the extraordinary care that, in public as well as private life, must frequently be employed, by those who know it best, to prevent the publication of the truth. Add, that the heroes of history depend, for the interpretation of their conduct, upon circumstances wholly independent on their virtues and vices. If Protestantism had not been subsequently established, would Mary have descended to posterity with the cognomen of The Bloody? and is no part of the traditionary character of Charles II. to be attributed to the puritanical temper of the age in which he lived, and to the jaundiced eyes of subdued roundheads? or of that of Cromwell, to the event of the restoration?

History, then, must be regarded with due consideration of the circumstances under which its composition has taken place. Thus, we must always suspend our belief in the vices of a deposed prince, or a fallen party; we must receive the epithets, *vast, magnificent, glorious*, and their opposites, with caution, and look for measurements and facts: we must suspect the history of the past, on account of want of information, and of the present on that of want of honesty; the first is often falsified through ignorance, and the second through party spirit; and we must suspect the history of all times, because of prejudice, from which no historian has been free.

He that writes the history of his own times, is not only in danger of being partial, but of unacquaintance with many things, which time tardily brings to light; and he that writes the history of a former period, is wholly ignorant of that of which he pretends to speak, and dependent on the *dicta* of others. If his authorities are few, half the truth is more than he ought to hope for; and if they are numerous, they almost uniformly belie each other.

There have been many mechanical helps composed to the attainment of history, as well with regard to the chronological order of events, as with respect to the several revolutions that have occurred in the world, and in particular empires, kingdoms, and states. Such is Priestley's chart which embraces general history.

HIVES. See Croup.

HOARSENESS, a diminution of the voice, generally attended with an unnatural asperity and harshness. It arises, mostly, from defects in the larynx and windpipe; from an ulcerated or ossified state of those parts; or from the acrimony of the bile: and it is not unfrequently a concomitant of catarrhous coughs, and scorbutic affections.

Lubricating medicines ought first to be administered, in order to obtund the acrimony of the humours, and to relax the strictness of the glandular parts. For this purpose, mucilaginous broths, decoctions or infusions of emollient vegetables, such as the dwarf, common, and marsh-mallows; and the syrups of hedge-mustard or horse-radish, will be found eminently serviceable.

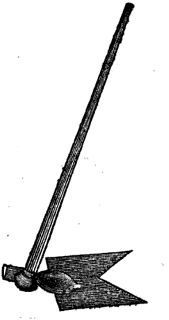
If hoarseness be the consequence of a Cough, (which see) the removal of that complaint will restore the voice to its natural tone. In every instance, however, the bowels ought to be kept regular; and, if scorbutic affections be the cause of hoarseness, it will again depend on the removal of the disease, which pervades the whole system. Where this complaint is inveterate, tonics, attenuants, and expectorants, have frequently been found of service.

In many recent cases, however, the most speedy relief will be obtained by bathing the feet in warm water for about half an hour, previously to retiring to rest; when, by a few days temperance in diet, and by carefully avoiding to take cold, this troublesome affection will gradually disappear.

HOE, or How, a well known implement of husbandry, designed for eradicating weeds from gardens, fields, &c This tool is of great utility, and ought to be more frequently employed in stirring the unoccupied corners and spots of land, during the more vacant seasons of the year, by which operation the soil will be considerably improved.

To facilitate this important object, we shall present to our readers several hand-hoes, much superior to those in common use, and which, from their simplicity, deserve to be more generally known.

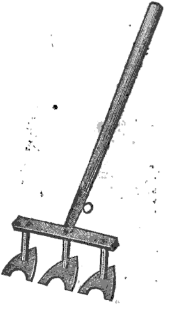
The first is the *Portuguese Hoe*, lately described and recommended by the patriotic Lord Somerville, and of which the following is a representation:



The handle of this implement is from three feet to three feet four inches in length; and, as it is both light and short, it is peculiarly calculated for strong lands and mountainous situations; because the hoe, by its weight and pointed form, cuts deeply into the earth, without requiring much exertion

The second is the *Horse-shoe Hoe*, invented by Mr. Mark Ducket, of Esher, Surry.

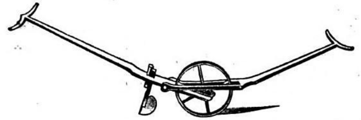
This hoe is furnished with a ring or loop, as above represented, near the bottom of the handle, for holding a strap, which is fastened round the waist of the persons at work, as they walk backwards. It is eminently useful for cleaning crops of every description, whether *drilled* or *hand-set* in rows. Mr. Ducket has judiciously availed himself of a short handle and heavy iron work, the exact reverse of the common hoe, which requires great exertion to make any impression on the soil (excepting on the lightest sands) especially if it has become dry and hard.



It is evident from the preceding cut, that Mr. Ducket's hoes, by their convex form, earth up as well as down; though the same implement may also be made with *straight* edges; namely, for drilled or dibbled crops at six inches interval; for clearing pease, beans, &c.

at 18 inches distance; and for dressing crops of any description, at 12 inches interval. Should these hoes, however, from their *straight* edge, be unequal to cope with stiff land, Lord SOMERVILLE suggests the expediency of adopting the *conical* edge (or the edge opposite to that in the horse-shoe hoe) which will remarkably increase their power. Lastly, his Lordship observes, that *three* flat-hoes at six inches; *two* flat ones at twelve inches; and *three* horse-shoe hoes, form the whole number requisite: and that they all screw into the same frame and handle.

The last hand hoe, we shall notice, is constructed on an improved principle by Mr. JAMES M'DOUGAL, now of Oxford street, London; for which the *Society for the Encouragement of Arts*, &c. in 1793, conferred on him a premium of twenty guineas. This contrivance, which is represected in the annexed cut,



consists of two principal parts: the first of them is a beam of wood, which, at its fore-end has a semi-circle, forming two handles, between which one man walks and draws the implement forward. At the other end this beam is divided and moves on two small gudgeons, by which it is accommodated to the height of the hands of the person drawing, and room is allowed for the movement of a wheel.

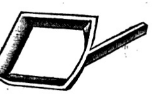
The farther end of the opposite beam is held by another person, who guides the hoe, and regulates the depth to which it penetrates the ground, while he at the same time assists its action by pushing it forward. The fore-end of this beam is also divided so as to admit a wheel to run between the sides, which serves to adjust the depth, and to ease the draught, in working the implement.

Mr. M'DOUGAL's hoes are made of cast-iron, and fixed in a mortice in the binder beam, by means of a proper wedge; they may be made of different forms or dimensions, in proportion as is required by the peculiar nature of the work.

The design of this contrivance is to clear land from weeds, and to loosen the soil in the intermediate spaces of pulse or grain, sown in equi-distant rows, while the plants are at the same time sufficiently earthed up, in consequence of which they vegetate with increased luxuriance; It is calculated to effect these objects in an eminent degree, and from the simplicity of its construction, and the facility with which it is worked, it claims the attention of all agriculturists.

Dr. MEASE has used an earthing hoe fixed in a beam, exactly like Mr. M'D's, with great advantage.

But when the mere destruction of weeds is required, Mr. JOHNSON of Brunswick, New Jersey, takes out the hoe and introduces an instrument called in England a *scuffle*, which cuts the roots under the surface, and deposits the earth in its original place again. The scuffle is a very simple instrument, being nothing more than an iron blade fixed between two prongs; the handle of which may also be made of iron.



While the blade cuts the weeds off, under the surface, they fall between the prongs into their place again ; and die without leaving the earth too much exposed to the sun. This instrument fixed to a long handle is common in gardens, but when fixed in a beam is certainly much improved with respect to the diminution of labour. A man and a boy will accomplish more work in half a day, with the above hoe and scuffle, than could be performed by two men at the same work in one day, with common hoes, and from the experience of their utility, Dr. MEASE warmly recommends them to all who possess gardens.

HOEING, or HORSE-HOEING, in the drill-husbandry, is the breaking or dividing of the soil by tillage, while the corn, or other plants. are growing; it differs from the common mode of cultivation, which is always performed before the grain, &c. is sown, and is far more beneficial to the crop than any other method.

Horse-hoeing is practicable only on lands that are easily ploughed ; and it is from inattention to this circumstance, that it has not been attended with success, and has, in many parts of England, fallen into contempt.

Having already, described Dr DARWIN's ingenious drill-plough and horse-hoe, and given ample directions for their use, we shall, in this place, mention only such implements as have not been specified in the article DRILLING, and which merit particular notice.

A horse-hoe on a new plan was contrived a few years since by the ingenious Mr. DUCKET, whose inventions we have had frequent occasion to mention. It is made wholly of iron (including the carriage); and consists of two common plough-shares, which work from twenty to twenty-four inches of ground in breadth, accordingly as they are *winged*. These are fixed by means of wedges into a twisted beam, and the whole is put together with such strength, that they may be worked with four horses, at any depth required. Mr. DUCKET applies his hoe to various purposes, but chiefly to the eradicating of pea, bean, and other stubbles, in order to prepare them for the plough; and so effectually does the implement answer, that the corn may be sown, even though the soil should not have been previously ploughed.

In the 2d vol. of Dr. ANDERSON's *Recreations in Agriculture*, we meet with an account of an improved method of horse-hoeing; which is stated to be performed in the most perfect manner, merely by the aid of a *double-mould-board-plough*. It is particularly calculated for the clearing of weeds, &c. from cabbages, round which the earth is heaped, so as to make those plants thrive with uncommon luxuriance. For a minute account of this operation, the reader will consult the work before quoted; where its superiority over Mr. TULL's horse-hoeing system is pointed out, and the subject illustrated with cuts.

The best season for hoeing good land, is, two or three days after rain has fallen, or as soon after as the soil will not adhere to the hoe, when at work. Light, dry lands, indeed, may be dressed at almost any time ; but the season for hoeing strong clay-soils, is very frequently short and precarious. Hence it will be useful to point out the proper juncture. There is a period between the time of the clay-soils running together so as to form puddles, in consequence of superfluous moisture, and that of their consolidating into hard cakes from great drought; when they are sufficiently tractable. This is the proper season; and whatever land is then hoed, will not cake together, till it has been again penetrated by rain; in which case the operation is to be repeated at the time just mentioned, and as often as is necessary, till the growing crop begins to cover the soil; when it will in a manner screen the surface of the land against the intense heat of the sun; and consequently in a great measure prevent the inconveniences attendant on the consolidation of the soil, during dry weather.

By the successive hoeing, the land will be brought into a high state of improvement; and, if the weather prove favourable, good crops will be obtained, while, by a contrary practice, the soil is rendered useless ; and, from the stagnation of the water, becomes a public nuisance.

HOG, *Sus scrofa*, is distinguishable by its prominent tusks, the flat termination of its snout, its feet being cloven, the fore part of its back being bristly, and the tail hairy.

The male is called *boar* and the female *sow*. The appellations of *swine* and *pig* are given to the whole breed, though the latter is more peculiarly applicable to the young animals.

The parent stock of our domestic swine is the wild boar, which inhabits the forests of France, Germany, end other parts of Europe, as well as those of Persia and India.

Wild boars usually live in families, and are hunted as an amusement in all the parts of the world where they are found. The *flesh* of the wild animals, if they are not old, is said to be much superior to that of our domestic swine. That of the young ones is peculiarly delicate. Of an old wild boar the head only is at all eatable.

The advantages derived from the breeding of swine are very great. Their flesh, which has the appellation of *pork*, is in universal request; and is of peculiar importance in a commercial view, as it takes salt better, and is capable of being kept longer than any other kind of meat that we are acquainted with. Pork, after having been salted, is sometimes hung up to dry in the open air; but generally it is smoked by being hung in a chimney. In this state it has the general name of *bacon*. What are called *hams* are the thighs preserved in a similar manner. *Westphalia hams* are generally made from such animals as have been well fed and allowed to range at pleasure in the extensive moorlands of that province; and they have a singular flavour, not so much from any great difference that there is in the salting of them, as from their being smoked in chimnies where only wood fires are burnt. The time of fumigation is from three to six months according to their size. Pork, though a wholesome food, requires a strong stomach to digest it properly; but ham and bacon are highly improper for persons of weak and languid habits. *Brawn* is the flesh of the boar pickled in a peculiar manner, and is always better tasted according to the greater age of the animal of which it is made. After the boar is killed the head and legs are cut off, and the bones are carefully taken from the remaining part. This, after having been properly salted, is rolled together as hard as possible. It is then boiled till it becomes so tender as to be pierced with a straw. It is afterwards set by till quite cold, and lastly is immersed in a pickle formed with salt and bran boiled together. The usual mode of curing pork is with common salt, or bay salt; but some persons add saltpetre or nitre, juniper berries, pepper, and other antiseptic substances.

The Jews and Mahometans abstain from this species of food from a religious principle, and even consider themselves defiled by touching it. The inhabitants of China, on the contrary, are so excessively fond of pork, that multitudes from this partiality alone are said to have been prevented from conversion to Mahometanism.

The *fat* of swine differs in its situation from that of almost every other quadruped, as it covers the animals all over, and forms a thick, distinct, and continued layer betwixt the flesh and the skin, somewhat like the blubber in whales. It is called *lard*, and is applicable to various purposes both culinary and medicinal; and particularly to the composition of ointments. The usual mode of preparation is to melt it in a jar placed in a kettle of water; and in this state to boil it, and run it into bladders that have been cleaned with great care. The smaller the bladders are the better the lard will keep. The fat which adheres to the parts connected with the intestines differs from common lard, and is preferably employed for the greasing of carriage wheels. The *blood*, the feet, and the tongue, are all adopted for food.

The *skin* when properly dressed, is used for the seats of saddles; by bookbinders and other artisans. In China these skins are in much request by shoemakers. All the shoes that are sold to Europeans at Canton are made of hogs' leather, the hair having previously been burnt off with a hot iron. In our own country, when swine are killed for food, it is not customary to strip off the skin, but merely to rid it of the bristles by scalding the animals with hot water, or singeing them with lighted straw. Consequently the hogs' skins which we use are chiefly imported from abroad. The *bristles* of swine are made into brushes of various kinds, and are also employed by shoe-makers in the place of needles.

Among the other uses of swine it may not generally be known that, in the island of Minorca, they are employed as beasts of draught. They are frequently yoked to the plough with asses; and one writer speaks of having seen a cow, a sow, and two young horses all yoked together, of which he states the sow to have drawn the best. In some parts of Italy swine are used in hunting for truffles, an eatable species of fungus, which grow at the depth of some inches in the ground. A cord being tied to the hind-leg of one of these animals, the beast is driven into certain pastures where truffles are known to grow; and we are told that they are always to be found wherever he stops and begins to turn up the earth with his nose.

Most writers have asserted that swine are long-lived, but few instances are allowed to occur of their attaining a great age; as it is neither profitable nor convenient to keep them to the full extent of their time. A gentleman in Hampshire kept a sow till she was nearly seventeen years old; and at this period she began to exhibit some signs of old age by the decay of her teeth, and ceasing to be so fertile as she had previously been. This animal afforded an instance of the extremely prolific nature of swine. She is calculated to have been the parent of no fewer than 300 young ones. The great weight to which swine are sometimes fed would appear altogether incredible had it not been well attested. In one instance a pig was known to weigh 1410 pounds when alive; and 1215 pounds when killed and dressed.

The hog is proverbially the most rude and brutal of quadrupeds; its habits are gross, and such is its gluttony, that it devours every thing indiscriminately. But, though it be the most impure and filthy of animals, its sordidness is useful, inasmuch as it swallows with avidity, refuse and offal of every kind, so that matters which would become a nuisance, are converted into the richest nutriment.

Sows generally breed at the age of 18 months, or two years, and bring from five to ten or more pigs, twice or oftener in the year, after a gestation of four months.

As hogs, from their voracious nature, will eat almost every thing, they are very generally reared in all situations, being quickly and cheaply fattened. In miry and marshy grounds, where they delight to wallow, they devour frogs, fern, the roots of rushes, sedge, &c. In the drier countries, they feed on hips, haws, sloes, crabs, beech-mast, chesnuts, acorns, &c. on the last of which they thrive exceedingly. Of late years, however, the management of these animals has become an object of attention. Clover, potatoes, turnips, cabbages, and carrots, are, it is well known, articles with which they may be fed, and even fattened, at a small expense. Parsnips are of considerable utility for this purpose, and probably the roots of the white beet, if it were fully tried, would be found still more useful; for experiments have shewn, that it contains a considerable proportion of saccharine matter, and may be cultivated with very little difficulty.

The diseases to which hogs are subject, are but few; nor are they often troubled with them. The chief are, 1. The *measles*, said to be perceptible only in the throat, which, on opening the mouth, appears full of small tumours, that in some cases are visible externally. The remedy usually applied is the powder of crude antimony, in small portions, which generally removes the affection. 2. The *fever*, which is also called the *heaving of the lights*: it is cured by giving the diseased animal a mixture of oil and brimstone; 3. the *Mange*; 4. the *Murrain* or *Leprosy*; and, 5. the *Garget*; to which articles we refer the reader, in their respective order.

In purchasing *lean* hogs, the most certain method is to judge by weight. If, therefore, a farmer were to weigh a few lean pigs which were about the size of those he intends to purchase, he would obtain some standard on which to proceed, and will consequently be able to bid a fair price in the market.

With respect to *fat* hogs, it has been proved from repeated experiments, that every 20 lbs. live weight will yield, when killed, from 12 to 14 nett weight. In those which do not exceed 12 stone (14 lbs. to the stone,) the weight will be 12 lbs.; but, in larger animals, it will in general amount to about 14 lbs. If, therefore, a farmer weigh them alive, he will not only know the clear profitable weight when killed, and consequently its value, but he will also, by weighing the animal every week, be able to ascertain the proper time to slaughter, or dispose of it to the best advantage; for, when the hog ceases to acquire that daily increase which renders it profitable, the best course that can be followed is, to kill him immediately.

Mr. Billingsley prefers large hogs to small, for profit: and observes, that small growing pigs ate nearly as much food as the large full-grown hogs, and yet they did not appear proportionably to improve either in size or fat; that advantage was derived from mixing up a quantity of meal a week or two before it was used; that no kind pay more for food than spayed sows; they fatten quicker and on less food.—*Bath Society Transactions.*

In April 1769 a hog was killed at Williamsburgh, Virginia, which weighed 1050 lbs. after the blood, bowels, and hair had been taken from him. It is supposed he weighed upwards of 1200 lbs. when alive.

In March 1787, another hog was killed at Newport, Rhode Island, which weighed, when gutted and dressed 834 lbs. The length of the animal is said to have been nine feet, and height six feet.

The owners of these hogs were guilty of a very unpatriotic act, in sacrificing animals which would have been so highly valuable for breed. In future it is to be hoped, a similar error will not be committed.

"A sow kept at Hollowmire, near Ulverston, only four years old last September, has farrowed 229 pigs, which is on an average of 57 per year, and except at the first time, always brought up thirteen. Within 19 weeks and three days she has farrowed twice. The animal went to the male the next day after the pigs were taken away, which was done when they were three weeks old. *Lon. Month. Mag. Jan'y.* 1798."

Under the article CATTLE, the economy of feeding with boiled food was mentioned with confidence, though no direct experiment was adduced to support the opinion. The following comparative experiment, however, settles the point. Mr. TIMOTHY KIRK of York Town, Penn. fed one pig with boiled potatoes and Indian corn, (mayz) and another with the same articles unboiled. The two animals were weighed every week, and the difference between them was as 6 to 9. The experiment was continued several weeks, and the animals alternately fed upon boiled and unboiled food, with an uniformity of result, which sufficiently proved the very great profit arising from boiled food.

Mr. KIRK's very excellent and economical boiler shall be described under the article WATER. There are few domestic conveniences that exceed this in point of utility.

HOGSHEAD, in mensuration, a measure of capacity, containing sixty-three gallons of wine, and fifty-four of beer.

HOLIBUT, *Pleuronectes hippoglossus*, is a flat fish of considerably lengthened shape, of olive or blackish colour above, with smooth body, and the tail hollowed at the extremity. The eyes (as viewed from the head towards the tail) are on the right side.

These, the largest of all the European species of flat fish, inhabit both the European and American seas, and frequently weigh from 100 to 300 or 400 pounds each.

As the holibut is found only at the bottom of the water, the usual mode of catching it is with hooks and lines; and its size is so great that for sale in the markets it is customary to cut it into pieces. The season in which it is most esteemed is during the months of October, November, and December.

Though in general a coarse food, the parts which are near the side fins are fat and delicious, but too rich for any one to eat much of them. The inhabitants of Greenland eat of these fish both fresh and dried. They also eat the *skin* and the *liver;* and the *membrane of the stomach* serves instead of glass for windows. The Swedes and Icelanders make of holibut a food called *raff* and *rachel;* the former consisting of the fins with the fat skin to which they are attached; and the latter of pieces of the flesh cut into stripes, salted, and dried on sticks in the air. Holibuts are also salted in the same manner as herrings, which is said to be the best mode of curing them; but in this state they are coarse and bad eating.

HOLLY, *Ilex aquifolium*, is a small evergreen tree, with shining, irregular, and spinous leaves, and white flowers which grow in clusters round the branches, and are succeeded by small red berries.

In those parts of the country where hollies are very abundant they afford a cheerfulness to the scenery in winter which is extremely pleasing. It is on this account principally that they are planted in gardens and shrubberies. The barbarous taste of our ancestors was such that they frequently clipped them into the shape of birds, quadrupeds, and other fantastic representations of nature.

As a fence, holly is eminently serviceable. When formed into hedges, it admits of being cropped, and retains its verdure and beauty, even through the severest winters, without injury. Its growth is slow, and its duration longer than that of most other trees. The *wood*, which is hard and close grained, is much used in veneering, and is frequently stained black, to imitate ebony. It is likewise advantageously used in making handles for knives, cogs for mill-wheels, and other purposes. The *leaves* in winter afford a grateful food to sheep and deer; and the *berries* yield a subsistence, during this inclement season, to the feathered tribes. In some places, particularly in the island of Corsica, the inhabitants employ the seeds of holly for making a beverage somewhat similar, but much inferior to, coffee.

The *bark* of the holly is smooth, and replete with a strong mucilaginous substance, from which the article called *bird-lime* is made. For this purpose it is boiled ten or twelve hours; and when the green rind is separated, it is covered up in a moist place, to stand for a fortnight. It is afterwards reduced to a tough paste, and washed in a running stream until no impurities are left. The next part of the process is to suffer it to ferment for four or five days; after which it is mixed over the fire, with a third part of nut-oil, or some other oily fluid, and is thus rendered fit for use.

Holly deserves to be much more extensively cultivated than it now is. Some years ago a person who purchased a holly-wood in Yorkshire, (Eng.) sold the bird-lime prepared from the bark to a Dutch merchant, for nearly the whole sum of his original purchase. Bird-lime has an adhesive quality very remarkable, particularly to feathers and other dry substances. It is on this account employed for the smearing of twigs to ensnare birds. In its elasticity and inflammable nature it has much resemblance to Indian rubber; and, if any means could be adopted to harden it, there is little doubt but it might be substituted for that article.

Amongst the ancient Romans it was customary to send branches of holly to their friends with new-years' gifts, as emblematical of good wishes. We decorate our houses and churches with it at Christmas, to give, as it has been observed, an air of spring in the depth of winter.

HOLLYHOCK, or *Altea rosea*, L. a beautiful exotic plant, frequently cultivated in our gardens. It is a native of China; grows to the height of 8 or 9 feet; and nearly the whole of its stalk is covered with white, red, brown, yellow, or variegated flowers, that continue to blow till September.

HONE, or WHET-SLATE, is a well known kind of stone, of somewhat slaty texture, and generally of dull white, or greenish grey colour. Its surface is smooth, and feels unctuous to the touch.

These stones, when properly cut and smoothed, are of indispensable utility to carpenters, cutlers, and others, for the sharpening of their cutting instruments. Those of the finest grain are used for lancets, pen-knives and razors. For this purpose their surface, when used, is covered with a small quantity of oil; by which, after a while, they are rendered considerably harder than they were at first. There is a vulgar and erroneous notion that hones are holly wood, which, by lying in petrifying water, have been thereby converted into stone. The greater part of them have a fine and a coarse side. From the circumstance of their having been originally brought into this country from Turkey and the Levant, they are sometimes called *Turkey stones*. They are now found in Saxony and Bohemia, in North Wales, and near Drogheda in Ireland.

HONEY, a saccharine substance, collected by bees from the flowers of various plants, and deposited in their comb. The honey is extracted either by expression, or by placing the comb in a warm situation, when it liquifies and comes away in a pure state, The best honey is of a thick consistence, and a whitish colour, inclining to yellow, and of an agreeable smell and taste: but both the colour and flavour are said to differ according to the plants from which it has been collected. Honey appears to consist of vegetable juices, either oozing, with a portion of their essential oil, from flowers, or previously collected from the leaves and branches of trees, by vine-fretters, and then known by the name of honey-dew. These juices, the bees transport by means of their probosces; and, after giving them a certain preparation, probably in their stomachs, deposit them in their cells. That the juices do undergo some preparation, appears almost undeniable, since the honey wrought by young bees is white, and more pure than that produced by old. The former is called *virgin honey*.

As an article of food, when immoderately used, honey is pernicious to weak stomachs; it ought, therefore, to be avoided by persons liable to eruptions of the skin, or in whom there is a redundancy of bile. This vegetable essence contains an acid, similar to that of sugar, but is more spirituous; hence it readily ferments, occasions flatulency, and in some habits produces gripes and looseness.

Honey is also convertible into an agreeable liquor, termed Mead, of which the reader will find an account in its alphabetical order.

Although Prof Lowitz has satisfactorily proved that honey may, by a chemical process, be consolidated into sugar; yet, as such a change would not be profitable, where the former is sold at a much higher price than the latter, we shall suggest a more advantageous mode of employing this balsamic juice. If a pound of honey be dissolved in three or four quarts of water, and exposed to a temperature between the 70th and 80th degrees of Fahrenheit's thermometer, it will in a short time become a very agreeable acid liquor, which possesses an aromatic flavour, and strength, superior to that of the best *vinegar* made of white wine. As the latter is frequently adulterated, and incomparably more expensive than the substitute we have proposed, this appears to deserve every attention in domestic economy.

HONEY-COMB, a waxen structure, full of cells, constructed by the bees, to deposit their honey and eggs in. The structure of the honey-comb seems one of the most surprising parts of the works of insects, and the materials of which it is composed, which though evidently collected from flowers, yet do exist in them in that form, a circumstance which has given great cause of speculation to the curious. The regular structure of the comb is equally wonderful. When the several cells are examined, it should seem that the nicest rules of geometry have been consulted, and that all the advantages that could be wished are found in it. Each cell consists of six plane sides, which are all trapeziums, but equal to each other: the bottom of the cell is contrived with three rhombuses, so disposed as to constitute a solid angle under three equal angles, hence a less quantity of surface is sufficient to contain a given quantity of honey than if the bottom had been flat. The method of making two sorts of cells in each comb is also admirably contrived to save the expense of wax, since had they been made single, every comb must have had its peculiar base, and every set of cells their bottom of wax, whereas one bottom now serves two cells. This structure occasions a great saving of wax, and strengthens in a high degree the whole work. See Bee.

HONEY-DEW, or *Suffusio mellita*, a sweet substance found on the leaves of oak, hazle-nut, hops, and other plants; and which has been erroneously supposed to fall from the sky.

According to Dr. Darwin, the honey-dew is a saccharine juice that exudes from trees, in consequence of the retrograde motions of the cutaneous lymphatic vessels connected with the umbilical, or with the common sap-vessels of plants; instead of being carried forward to increase the growth of the present leaf-buds, or to accumulate nutriment for the buds, which are in an embryon state.

This exudation is consequently very injurious to the trees which are subject to it; especially from its great sweetness, which attracts immense numbers of bees and ants.

Mr. Forsyth directs those trees, which are most liable to such distemper, to be sprinkled with a mixture of limewater and urine; after which they should be washed with the liquid, stated in the article Blight. These remedies, however, ought to be applied early in the morning; in order that the trees may become dry, before the solar rays produce intense heat; as, otherwise, the blossoms and leaves are apt to be scorched, and thus to be materially injured.

The Abbe Boissier, has found that there are two kinds of honey-dew, the one produced by transpiration, during a sultry heat, from the leaves of particular genera of trees; while the other is the excrement of the small insect known by the name of *puceron* or *vine-fretter*.

Bees are fond of both kinds of honey-dew, but particularly of the latter. The vine-fretters finding the greatest plenty of juice about the middle of summer, afford, also, at that time, the greatest quantity of honey-dew: and, in autumn, when, however, it is less in quantity, the bees prefer this to the honey of the flowers then in season. It is, indeed, their chief resource for subsistence after the spring flowers, and transpiratory honey-dew, are gone, and, as the trees, though pierced to the sap in a thousand places, do not seem to suffer in the least, the husbandman who destroys the insect, probably mistakes his interest.

HONEY-SUCKLE, or *Lonicera*, L. a genus of plants consisting of 20 species, two of which are natives of Britain, viz.

1. The *Periclymenum*, Common or Woodbine Honey-suckle, which grows in hedges and woods, and flowers from June to August. It is eaten by cows,

goats, and sheep, but refused by horses. The beauty and fragrance of its variegated flowers, render this species a pleasing ornament of our gardens, hedges, and arbours. The best, as well as the easiest method of propagating it, is by layers and cuttings, both of which readily strike root, and form plants that are fit to be set out in one year. The ripe berries are strongly purgative.

2. The *Xylosteum*, or Upright Honey-suckle, which grows on walls and in hedges; it flowers in May. According to Linnæus, this shrub forms excellent garden hedges in a dry soil, especially where flocks of sheep are frequently passing, as these animals do not eat the leaves. Its wood is extremely hard, and makes the best ram-rods, as well as pegs, or pins for musical instruments, teeth for rakes, and similar articles. The small reddish and juicy berries excite vomiting, and are so powerfully laxative, that they are not touched even by birds.

HONEY SUCKLE, the Dwarf. See Dwarf Cornel.

HOOF, the horny part which covers the feet of many valuable quadrupeds; but in this place we shall treat of it only so far as it relates to that useful animal the *horse*.

A *perfect hoof* should be round, smooth, tough, and short, so that the horse may tread more upon the toe than upon the heel: it should also be rough and somewhat hollow within, having a narrow frush and broad heels. On the contrary, imperfect hoofs are rather broad than round; and, if spreading out of the sides and quarters, the heels of such a horse are generally narrow, and will sooner or later become *flat-hoofed*, have a weak foot, and not carry a shoe long, nor travel far without surbating; thus, by treading more upon his heels than upon his toes, he will walk low on his pasterns, and his feet, through weakness, will become subject to what are called false quarters, Gravelling, (which see) and other maladies, of which we have subjoined a short account.

HOOF-BONEY, a distemper arising from external injury, either a stripe, blow, or by a horse bruising himself in his stall, by attempting to strike at the next animal, but missing his aim, and dashing the foot against the post or rail that separates them. It consists of a round horney swelling on the uppermost part of a horse's hoof.

To bring this hard tumour to maturity, it may be covered either with a poultice of hay boiled in stale urine, or with a plaster of wine-lees and wheat flower simmered together over a fire. By such applications, it is generally dispersed; but, if it should come to a state of suppuration, it must be lanced in the soft, lower part, to give vent to the matter; and then covered with a plaster made of the following ointment: Take equal parts of turpentine, suet, and wax; melt them together carefully over a slow fire. The use of this salve should be continued, till the ulcer is perfectly healed.

HOOF-BOUND, an unnatural contraction of a horse's hoof, on the top and at the heel, so that the skin appears to grow over the hoof. It is easily discovered by the frequent halting of the horse, and the hollow sound of the diseased hoof: it arises from various causes, such as keeping him too dry in the stable; an injudicious method of shoeing; paring the soles as often as the animal is shod, &c.

As this malady always approaches gradually, it may be relieved at the commencement of every stage, or species of it, by proper management; but, if it become inveterate, no art whatever can effectually remove it.

The first species proceeds, in general, from the injudicious use of concave shoes, or from paring and hollowing out the sole and binders as often as the shoes are renewed. Hence, the heels become so thin, that the crust at the extremity may be forced into contact by the slightest pressure; the contraction of the hoof at length becomes general, and incurable. The only remedy in this case is, to keep the hoofs cool and moist, never to suffer them to be greased, or the soles to be pared, and to use only flat, narrow, and open-heeled shoes. Thus the stricture on the heels and frog will be in some measure removed, the animal affected considerably relieved, and the disorder at length so far palliated, as to enable him to walk with more firmness.

Another species is a contraction of one, or frequently of both heels, in *flat* feet, from the use of concave shoes, &c. The best remedy in this case is, to lay aside such improper shoes; to pare or rasp to the quick the whole contracted quarter of the crust near the heel, but without drawing blood: a *barred* shoe is then to be put on, so as to make the bar of the shoe press upon the frog; the hoof should be kept moist, and the diseased animal turned out to grass. Thus the stricture of the hoof will gradually disappear, the contracted part expand; and a new hoof grow from the coronet downwards, that will acquire a round, proper shape, and in a short time the horse will be restored to his former activity.

HOOF-BRITTLE, or BRITTLEHOOF, a disorder in horses, which is either constitutional in the animal, or arises from a surfeit, and as farriers express it, falls down into his feet; or, is the consequence of the horse having formerly been FOUNDERED (which see). To remove this malady, some prescribe the following ointment to be liberally applied to the hoofs two or three times a day: Melt equal quantities of turpentine, mutton-suet, raw bees-wax, hog's-lard, and salad-oil, in an earthen pot.

HOOF-CASTING, a misfortune that sometimes befals a horse, when the horny substance entirely separates from his foot, in consequence of his foundering or slipping, which breaks it on the top round the coronet, so that it at length drops off.

The hoof must be defended with care, by wrapping it up in tow covered with bees-wax and oil, and any fungous flesh that may appear, taken down by burnt alum or blue vitriol, whilst the animal must be suffered to rest. Where the disease proceeds from improper hay, or from meadow grass not duly watered, the remedy is obvious.

HOP, the COMMON, or *Humulus Lupulus*, L. an indigenous plant, growing in hedges, and flowering in June.

Hops delight in a good rich loam, with a deep sub-soil or stratum of a loamy brick-earth, in a southern or western exposure; though they grow in almost any ground that is not wet. They are chiefly cultivated in the southern counties of England, and are propagated either by nursery-plants or by cuttings. These are set in *hills*, formed by digging holes in the spring, which are filled with fine mould and the number of which varies from 800 to 1000, or 1200 per acre. One, two, or three plants are put in each hill; but, if hops are designed to be raised from cuttings, four or five of these, from three to four inches in length, are planted and covered one inch deep with fine mould.

At the end of the first year it becomes necessary to put poles into the hills, round which the bines reared from plants are wound: at the expiration of the second year, full-sized poles from 15 to 20 feet are set (though the hop-bines will run to the height of 50 feet), in the proportion of two poles to each hill, and a similar number of hop-plants are fastened loosely round each pole, by means of withered rushes.

Hops begin to blow toward the middle of June, and about the end of August they are generally fit to be gathered. The most proper time of collecting them is, when the leaf rubs easily off the bine, when the hops have a strong scent, and the seed assumes a brownish colour.

The culture of hops, though profitable when it succeeds, is very precarious: as soon as the plant appears above ground, it is attacked by an insect somewhat similar to the turnip-fly, which devours the young heads. Hop-gardens, situated on chalky soils, are peculiarly subject to its depredations; and the best remedy is to manure the soil highly with *malt-culm*, which adheres so strongly to the insects, as to prevent them from creeping over the plant.

The hop is an article of growing importance in the United States, and should be cultivated by every farmer more or less, as they require little trouble and pay well. Farnham hops are the best.

The following directions for raising and curing hops are taken from the *Trans. Agric. Soc. of New York*.

A rich deep soil, rather inclining to moisture, is, on the whole, the best adapted for the cultivation of hops; but it is observable, that any soil, (stiff clay only excepted) will suit the growing of hops when properly prepared; and in many parts of Great Britain they use the bog-ground, which is fit for little else. The ground on which hops are to be planted, should be made rich with that kind of manure best suited to the soil, and rendered fine and mellow by being ploughed deep and harrowed several times. The hills should be at the distance of six or eight feet from each other, according to the richness of the ground. On ground that is rich, the vines will run the most, the hills must therefore be farthest apart.

At the first opening of the spring, when the frosts are over, and vegetation begins, sets, or small pieces of the roots of hops, must be obtained from hops that are esteemed the best* cut off from the main stalk or root, six or eight inches in length. Branches, or suckers, most healthy, and of the last year's growth, must be sought for. They may easily be known by their looking white. Two or three joints or buds should be left on each set. The sets should be put into the ground as soon as taken up, if possible; if not, they should be wrapped in a cloth, kept in a moist place excluded from the air. A hole should then be made large and deep, and filled with rich mellow earth. The sprouts should be set in this earth, with the bud upwards, and the ground pressed close around them. If the buds have begun to open, the uppermost must be left just out of the ground; otherwise, cover it with the earth an inch. Two or three sets to a pole will be sufficient, and three poles to a hill will be found most productive. Place one of the poles towards the north, the other two at equal distances, about two feet apart. The sets are to be placed in the same manner as the poles, that they may the easier climb. The length of the poles may be from fourteen to eighteen feet, according as the soil is for richness. The poles should be placed inclining towards each other so as to meet at the top, where they may be tied. This is contrary to the European method, but will be found best in America. In this way they will strengthen and support each other, and form so great a defence against the violent gusts of wind to which our climate is frequently subjected in the months of July and August, as to prevent their being blown down. They will likewise form a three-sided pyramid, which will have the greatest possible advantage from the sun. It is suggested by experience, that hops which grow near the ground are the best. Too long poles are not good, and care must be taken that the vines do not run beyond the poles: twisting off their tops will prevent it. The best kinds of wood for poles are the alder, ash, birch, elm, chesnut and cedar. Their durableness is directly the reverse of the order in which they stand, and burning the end put into the ground, will be of service to preserve them. Hops should not be poled till the spring of the second year, and then not till they have been dressed. All that is necessary for the first year, is to keep the hops free from weeds, and the ground light and mellow, by hoeing often, and ploughing if the yard is large enough to require it. The vines when run to the length of four or five feet should be twisted together to prevent their bearing the first year, for that would injure them. In the months of March or April of the second year, the hills must be opened, and all the sprouts, or suckers, cut off within an inch of the old root, but that must be left entire with the roots that run down*; then cover the hills with fine earth and manure. The hops must be kept free from weeds, and the ground mellow, by hoeing often through the season, and hills of earth gradually raised around the vines during the summer. The vines must be assisted in running on the poles with woollen yarn, suffering them to run with the sun.

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* Of the different kinds of hops, the long white is most esteemed. It yields the greatest quantity, and is most beautiful. The beauty of hops consists in their being of a pale bright green colour. Care must be taken to obtain all of one sort, but if different sorts are

By the last of August or first of September, the hops will ripen and be fit to gather. This may easily be known by their colour changing, and having a fragrant smell: their seed grows brown and hard.† As soon as ripe, they must be gathered without delay, for a storm, or frosts, will injure them materially. The most expedient method of picking hops, is to cut the vines three feet from the ground, pull up the poles and lay them on crotches horizontally, at a height that may be conveniently reached. Put under them a bin of equal length, and four may stand on each side to pick at a time. Fair weather must be taken to gather hops in, if possible; and hops ought not to be gathered when the dew is on them, for dew is apt to make them mould. They should be dried as soon as possible af-

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used, they must be kept separate in the field; for there is in different kinds of hops a material difference in their time of ripening; and if intermixed, will occasion extra trouble in gathering.

* Hops must be dressed every year as soon as the frost will permit. On this being well done, depends in a great measure the success of the crop. It is thought by many to be the best method to manure the hop yard in the fall, and cover the hills entirely with manure; asserting, with other advantages, that this prevents the frosts during the winter, from injuring the hop. The truth of this may be determined by experiments in our climate and country.

† Hops had better be gathered before they are quite ripe, than remain till they are over ripe; for then they will lose their seed by the wind, or on being handled. The seed is the strongest part of the hop, and they will lose their green colour which is very valuable.

ter they are gathered; if not immediately, they must be spread on a floor to prevent their changing colour. The best mode of drying them is with a fire of charcoal, on a kiln covered with hair cloth, in the manner of a malt-kiln.* The fire must be kept steady and equal, and the hops stirred gently. Great attention is necessary in this part of the business, that the hops be uniformly and sufficiently dried: if too much dried they will look brown, as if they were burnt; and if too little dried they will lose their colour and flavour. They should be laid on the hair-cloth about six inches thick, after it had been moderately warmed; then a steady fire kept up till the hops are nearly dry, lest the moisture or sweat, that the fire has raised, should fall back and change their colour. After the hops have been in this situation about seven, eight or nine hours, and have got through sweating; and when struck with a stick, will leap up, then throw them into a heap; mix them well and spread them again, and let them remain till they are all equally dry. While they are in the sweat, it will be best not to move them, for fear of burning them. Slacken the fire when the hops are to be turned, and increase it afterwards. Hops are fully dried when their inner stalks break short, and their leaves are crisp and fall off easily. They will crackle a little when their seeds are bursting; and then they must be taken from the kiln. Hops that are dried in the sun, lose their rich flavor, and if under cover, they are apt to ferment and change with the weather, and lose their strength. Fire preserves the colour and flavour of hops, by evaporating the water, and retaining the oil of the hop. After the hops are taken from the kiln, they should be laid in a heap to acquire a little moisture to fit them for bagging. It would be well to exclude them from the air, by covering them with blankets. Three or four days will be sufficient for them to lie in that state. When the hops are so moist that they may be pressed together without breaking, they are fit for bagging. Bags made of coarse linen cloth, eleven feet in length, and seven in circumference, which hold two hundred pounds weight, are most commonly used in Europe: but any size that best suits may be made use of. To bag hops, a hole is made through a floor large enough for a man to pass with ease; the bag must be fastened to a hoop larger than the hole, that the floor may serve to support the bag, and for the convenience of handling the bags, some hoops should be tied in each corner to serve as handles. The hops should be gradually thrown into the bag, and trod down continually till the bag is filled. The mouth of the bag must then be sewed up, and the hops are fit for market. The harder hops are packed, the longer and better they will keep; but they must be kept dry. In most parts of Great Britain where hops are cultivated, they estimate the charges of cultivating an acre of hops at forty-two dollars, for manuring and tilling, exclusive of poles and rent of land. Poles they estimate at sixteen dollars per year, but in this country they would not amount to half that sum. An acre is computed to require about three thousand poles, which will last from six to twelve years, according to the kind of wood used.

The English growers of hops think they have a very indifferent crop, if the produce of an acre does not sell for one hundred and thirty-three dollars, and frequently they sell for two hundred dollars; and have been known to rise as high as four hundred dollars. In this country experiments have been equally flattering. A gentleman in Massachusetts, in the summer of 1791, raised hops from one acre of ground that sold for three hundred dollars; and land is equally good for hops in this state. Upon the lowest estimate we may fairly compute the nett profit of an acre of hops to be eighty dollars, over and above poles, manure and cultivation.

There is one circumstance farther we think has weight, and ought to be mentioned. In the English estimate, the expense put down, is, what they can hire the labour done for by those who make it their business to perform the different parts of the cultivation. A great saving may therefore be made by our farmers in the article of labour; for much of it may be performed by women, children and the aged. Add to this, we have another advantage of no small moment. In this country the hop harvests will come between our two great harvests, the English and Indian, and interfere with neither: but, in England, the grain and hop harvests interfere, and create a great scarcity of hands, it then being the most busy time in the year. It is found by experience, that the soil and climate of the Eastern states are more favourable to the growth of hops than Great Britain; they not being so subject to moist foggy weather of long continuance; which is most injurious to hops. And the southern states are still more favourable to the hop than the Eastern states, in point of flavour and strength. The state of New-York unites some advantages from either extreme of the union. The cultivators of land in this state have every inducement which policy or interest can afford, to enter with spirit into the cultivation of hops. We shall, therefore, be enabled to supply our own demand, and export this article, instead of sending abroad for all we use; and no crop that can possibly be put on land, will yield an equal profit. This culture will require but little land—the labour may be performed at intervals, so as not to interfere or injure the other business of the farm, by the aged, women, and children.

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* Mats made of the splinters of walnut, or ash, will answer the purpose, and come cheaper than hair cloth.

There is no farmer of this state but may, with ease, raise from one quarter of an acre, to as much as three or four acres of hops, the advantage of which would in a few years, be most sensibly felt, by the individual concerned, and by the state at large. Vast quantities are consumed in Great Britain: but, having already pointed out the most proper methods of using them, under the head of Brewing, we refer the reader to that article.

From the leaves and flowery stalks of this plant, when dried, Dambourney dyed wool of a fine cinnamon brown, having previously dipped it in a diluted solution of bismuth. Berthollet remarks, that the expressed juice of hop-bines affords a very permanent red-brown colour.

In medicine, decoctions and syrups of hop-flowers are said to be attended with much benefit in pestilential fevers: a pillow filled with them, and laid beneath the head, has been found to procure sleep to patients afflicted with delirious fevers.

[The tincture of hops is also a very useful and not inflammatory narcotic: in many cases preferable to opium. Fill a bottle with hops, pour in fourth-proof brandy; keep it warm for three days: strain it: from two to three tea-spoonfuls is a dose.—T. C.]

Method of extracting the virtue of Hops in Brewing.—The usual method is to put in hops without any preparation, into the strong beer, or ale-wort; the consequence is, the richer and better the wort is, the less it will partake of the essence of the hops. The rich fat wort sheathes up the pores of the hop, and as it were embalms the leaves, so that the beer or ale wort can extract scarcely any part of the necessary quality of the hop: but when it is put into the small beer wort, a fluid of a more thin nature, there the pores are unsheathed, and the small beer is rendered too bitter; therefore the hops, before they are put into the strong drink, should be previously soaked in a pail of hot water.

To confirm the truth of this observation, take a quarter of an ounce of the best green tea, and instead of pouring on it simple boiling water, let the water have the same quantity of sugar boiled in it that would be necessary to sweeten so much tea, when made, and you will find that the sweetness of the water will prevent its extracting the grateful bitter flavour of the tea

Hop-trefoil. See Clover, the Hop; p. 477 of vol. 1.

HORARY *circle of a globe*, is fixed upon the brazen meridian, divided into 24 hours, having an index moveable round the axis of the globe, which upon turning the globe 15 degrees, will shew what places have the sun an hour before or after us: and will also point out the hour of the day or night all over the world at any given moment.

Horary *motion of the earth*, the arch it describes in an hour, which is nearly 15 degrees. Hence in reducing motion into time, if 15° is equal to 1 hour, 1° is equal to 4′; therefore the clocks at places 15° East of London are an hour faster than those of London, and the clocks at places 15° West of London, are one hour later than those of London.

HOREHOUND, the White, or *Marrubium*, L. a genus of plants comprising 12 species, one of which only is indigenous, viz the *vulgare*, or Common White Horehound, which grows on road sides, and among rubbish; it flowers from July to September.

This very bitter plant possesses an odour sufficiently grateful; when given in large doses, it operates as a purgative It is reputed to be both attenuant and resolvent; an infusion of the leaves in water, sweetened with honey, is recommended in asthmatic and phthisical complaints, as well as in most other diseases of the breast and lungs.

Bees collect honey from the flowers of the Common White Horehound, but the herb is not eaten by either horses, cows, sheep, or goats.

HOREHOUND, the Black, Fetid Horehound, or Hen-Bit, *Ballota nigra*, L. an indigenous perennial plant, growing on rubbish and in hedges; flowering in the months of July and August. No species of cattle will touch this vegetable, which is, nevertheless, highly prized by the Swedes, who consider it as an almost universal remedy in the diseases of cattle.

A strong decoction of the Fetid Horehound has been much recommended in hysterical and hypochondriacal cases. An infusion, or tea, made of equal parts of this plant, of betony leaves, and white horehound, is asserted by Ray, both to prevent the gout, and mitigate the attacks of that painful disorder, if three or four tea-cupfuls of it be regularly drank every day.

HOREHOUND, the Water, or Gypsywort, *Lycopus Europæus*, L. an indigenous perennial plant, which grows on sandy ground, on the banks of streams and ponds; it flowers from July to September.

The French manufacturers are chiefly indebted to this plant for the deep black colour of their cloth; its juice imparts a permanent dye to wool, silk and linen, and is much used by travelling gypsies, for the purpose of staining their faces.

HORIZON, that great circle which divides the heavens and the earth into two equal parts or hemispheres, distinguishing the upper from the lower. The horizon is either sensible or rational: the *sensible* horizon is that circle which limits our prospect.

HORN, a hard substance growing on the heads of various animals, particularly on cloven-footed quadrupeds. The oil extracted from it, by repeated distillations, becomes extremely subtle and volatile; in which state it is called *oil of* Dippel, being the name of its inventor.

The horns of stags yield the greatest proportion of rectified animal oil, as they contain a larger quantity of that species of earth which is found in bones, than those of any other animals.

Horns form a considerable article in the arts and manufactures. Those of bullocks, when softened by heat, are converted into lanthorns, combs, knives, inkhorns, &c. After the horn is *roasted* over a fire made of the stalks of furze, so as to render it sufficiently soft, it is slit on one side, and spread out between a pair of flat tongs, large enough to keep it expanded a second time over the fire, and reduce it to a flat state; it is then put into a press between iron plates which are heated and greased. Here the horns are suffered to remain till they are gradually cooled; next they are soaked in water, till soft enough to be pared down to a proper thinness, with a large knife worked horizontally on a block.

Thus, they acquire their transparency; and, after being immersed in urine, they are polished, by rubbing them with whiting and the coal of burnt willow.

The refuse or shavings of horn are of considerable utility as a manure for chalky land, on which they are strewed in the proportion of fourteen bushels per acre. Their efficacy was not exhausted after a succession of four crops, each of which was remarkably improved. Hence they are advantageously employed on light and gravelly soils, together with hotter manures, preventing the latter from burning the crops; because horny substances have been observed to attract the dew, and retain moisture.

[Horn is tinged black by nitrate of lead, mercury or silver. In a Papin's digester horn is reduced to jelly.—T. C.]

To stain Horn to imitate Tortoise Shell.—The horn to be stained, must first be pressed into proper plates or scales, or other flat form. The following mixture must then be used:

Take of quick-lime two parts, of litharge one, and temper them to the consistence of a soft paste with soap ley. Put this paste over all the parts of the horn, except such as are proper to be left transparent, in order to the greater resemblance of the tortoise shell. The horn must then remain thus covered with the paste till it be thoroughly dry: when the paste being brushed off the horn will be found partly opaque and partly transparent in the manner of tortoise shell; and when put over a foil will be scarcely distinguishable from it. It requires some degree of fancy and judgment to dispose of the paste in such a manner as to form a variety of transparent parts, of different magnitude and figure, to look like nature. This may be done by mixing whiting with some of the paste to weaken its operation in particular places, by which spots of a reddish brown will be produced; that if properly interspersed, especially on the edges of the dark parts, will greatly increase, as well the beauty of the work, as its similitude with the real tortoise shell

HORN-BEAM, or *Carpinus*, L. a genus of plants consisting of five species, one of which is a native of Britain; viz. the *Betulus*, Common Horn-beam-tree, Hard-beam-tree, Horse or Horn-beech-tree. It grows in woods and hedges; flowers in the month of May.

The horn-beam will thrive on poor, stiff soils, on barren and exposed hills; and, if intended for trees, it is propagated by seed, as soon as it is ripe. It vegetates eighteen months before the plants appear above ground; and the young trees are transplanted at the age of two years, to the spots where they are intended to remain. When designed for hedges and underwood, it is propagated by layers.

The horn-beam is a very valuable tree, and grows to a large size; its leaves afford a grateful food to cattle, but no grasses will flourish under its shade. Its wood is very tough, white, and burns like a candle; it is much employed by turners; is very useful for various implements of husbandry; and is wrought into cogs for the wheels of mills, presses, &c. which are far superior to those made of yew. The inner bark imparts a permanent yellow colour to yarn. See also FENCE.

HORN-DISTEMPER, a disorder incident to horned cattle: it gradually wastes the internal substance of the horn, commonly called the *pith*, which is the spongy part of the bone, and the cells of which are filled with an oily matter Thus, at length, the horn becomes hollow.

From an account published by Dr. TOFTS, in the 1st vol. of the *Memoirs of the American Academy*, it appears that this spongy bone is sometimes partially, and sometimes entirely consumed. The horn is deprived of its natural heat, and on touching it feels unusually cold. When this malady is suspected, other symptoms should be particularly attended to; such as dulness in the countenance; a sluggish motion; want of appetite; a desire to lie down; and, if attended with an inflammation of the brain, a giddiness, and frequent tossing of the head. Stiffness, as in the rheumatism, affects the limbs; the milk often fails in cows; the udder is hard, and there is in most cases a sudden wasting of the flesh.

As soon as the distemper is discovered, an opening should be made in the diseased horn, with a gimlet of a moderate size, two or three inches above the head. If it be found hollow, and the gimlet pass through without any discharge of blood from the aperture, it will be advisable to bore lower, and as near to the head as the hollowness may probably extend. This aperture is asserted to be a necessary operation, and frequently affords speedy relief. It should, however, be carefully kept open, as it is liable to be filled up by a thin fluid that gradually oozes out, and obstructs the passage. Sawing off the horn has sometimes been adopted; but, from the best observations, boring is a preferable expedient. Dr. TOFTS supposes injections to be useless; as nothing more is required than to perforate the horn in an early stage of the distemper; and to keep it open, in order to admit fresh air, to prevent compression, and to promote the discharge of fluctuating matter. Should, however, the distemper have affected the brain, so as to produce a high degree of inflammation, no method of cure is likely to succeed; and the animal ought to be killed without farther delay, as otherwise its flesh would become useless.

[The hollow horn is owing to the effect of cold on animals that have not sufficient food to eat in the winter. It is owing to want of food and want of shelter.—T. C.]

HORNED POPPY. See POPPY, the Horned

HORNET, or *Vespa Crabro*, L. a well known insect, which is about one inch in length, and builds its nest in hollow trees.

Hornets are very voracious, devouring other insects, and even bees. Their sting is severe, and occasions a considerable tumour, accompanied with intense pain; for the mitigation of which, there is no better remedy than sweet-oil, or honey-water, immediately applied to the injured part.

Different methods have been suggested for exterminating these pernicious insects; the most simple of which appear to be the following: Towards the end of April, hornets are found on rotten planks, gates, and posts, in a torpid state: each of these insects contains the generation of a swarm; and as they may then be easily taken, the destruction of one, before they breed, is equal to the extirpation of numbers. After they are hatched, hornets chiefly infest melon-beds, where they occasion great injury to the fruit. In order to prevent these depredations, it has been recommended to procure slender rods of different lengths, and to rub the ends of them with bird-lime. By touching the insects with these rods, they may easily be taken; and, as the females only proceed in quest of food, by destroying these, the whole brood will consequently perish.

HOROLOGY, is that branch of science which enables us to measure the portions of time as they pass. We judge of the lapse of time by the succession of sensible events, and the most convenient and accurate measures of its quantity are derived from motions, which are either uniform, or repeated at equal intervals Of the *former* kind the rotation of the earth on its axis is the most exact, and the situation of the earth with respect to the fixed stars, or sun, constitutes the means for determining the parts of time as they follow each other. See DIAL. Of the *latter* kind the rotation of machinery, consisting of wheel work, moved by a weight or spring, and regulated by a pendulum or balance, affords instruments of which the utility is well known. The term horology is at present confined to the principles on which the art of making clocks and watches is established. In this article will be given an account of the structure of a common eight-day clock, and under the head WATCH, the machinery of that most common and useful article will be given.

Clocks were invented to measure time and all its subdivisions with great exactness: these consists of a combination of wheels, and they are usually regulated by the uniform motion of a pendulum.

The English word *clock* is derived from the German or from the French *la clocke*, a bell, against which it usually strikes the hour indicated.

Clocks and watches usually divide the hours into minutes, one hand, or index, pointing out the hour, the other the minutes. Some, however, carry the divisions, by means of a third index, to seconds.

In many cases the pendulum cannot, on account of its length and other circumstances, be made use of; hence the invention of watches, or as they were formerly called, pocket-clocks.

One was invented by Mr. GEORGE GRAHAM, which divided the second into sixteen parts, which was intended to measure small portions of time in astronomical observations, the time spent in the descent of falling bodies, the velocity of running waters, &c.

HORSE, (*Equus Caballus*) is distinguished from every other quadruped by having his hoofs single, and his tail covered with long hair.

The male has the name of *horse*, the female of *mare*, and the young one of *foal*.

Wild horses are found in large herds in Siberia, and several other parts of Asia, as well as in some parts of Africa and America.

Endowed with the most useful qualifications, the horse is an animal of the greatest importance to the inhabitants of all temperate climates. Though naturally spirited, active, and intrepid, he submits with patience to carry burdens, and to toil for days together along the roads, and in agricultural labours. And, if treated with care and attention, he perseveringly adapts himself to our wants and conveniences. In some parts of Tartary these animals have even been made objects of divine worship, originating no doubt in a principle of gratitude for the services they perform. By the Arabians they are nearly as much attended to and beloved as human beings; living in the same tents with their owners, and participating in all the kindnesses which they bestow upon their own families. In Arabia, indeed, these animals may be deemed the chief support of the families who possess them; and (surrounded with foes) the very existence of the owner not unfrequently depends upon the powers of his horse.

In no country of Europe is so much attention paid to the breeding and training of horses as in England. The consequence has been that the British horses are superior both in swiftness of foot, and in strength and perseverance in the course, to any others in that quarter of the world

The fleetest of all the British horses is of course the *race-horse;* and for short distances none of the Arabians which have been tried in England have proved in any degree equal to him. The celebrated horse called Childers, in the year 1721, ran four miles in six minutes and forty-eight seconds, carrying a weight of nine stone two pounds. Had the different racing meetings at Newmarket, York, and other places no other view than to call together great concourses of people for amusement, their tendency would be injurious rather than beneficial to society; but when it is considered that such meetings are the cause of great emulation in the breeding of a race of animals so valuable as the horse, their utility will be sufficiently apparent.

The English *hunters* are allowed to be among the noblest, most elegant, and most useful animals that are known; and the value of their *hackneys* or road horses may be imagined when it is stated that many of them are able to trot at the rate of more than fifteen miles per hour. In the year 1745 the post master of Stretten is stated to have ridden on different horses along the road to, and from London, no fewer than 215 miles in eleven hours and a half, which is at the rate of above eighteen miles an hour.

So great is the strength of these animals, that instances have been mentioned of a single horse drawing, for a short space, the weight of three tons; and of others carrying a load which weighed more than 900 pounds. The immense *dray-horses* which are employed by the brewers, and are so frequently seen in the streets of London, though in some measure useful as being able better to sustain the shock of loading and unloading than slighter animals, are chiefly kept from a principle of ostentation. The British *draught horses* are extremely valuable animals, but particularly a chesnut-coloured race called Suffolk horses.

In Scotland there is a breed of small horses or ponies, which are known by the name of *galloways*. The best of these seldom exceed the height of fourteen hands and a half,* and are extremely active, hardy, and spirited animals. The Shetland islands produce a race called *shelties*, which, though exceedingly diminutive in size, are in other respects highly excellent.

In Ireland the cart-horses, though of sufficient size, are ill-shaped and bad. The saddle horses appear naturally as good as ours; but in general they are ill kept, worse groomed, and still worse shod.

There is a prevalent and erroneous notion that the flesh of the horse is bitter and unpalatable. In several parts of Asia wild horses are killed almost exclusively for food; and the Calmuc Tartars, in particular, are so partial to this kind of flesh that they seldom eat any other. Horses' flesh is constantly exposed for sale in the markets of Tonquin. A celebrated British writer (Dr. Anderson) has strongly recommended the fattening of horses as food, and urges his recommendation by declaring that horse-flesh is superior in delicacy of flavour to beef!

The Tartars drink the milk of the mare, and also convert it into butter and cheese. One of their most favourite kinds of beverage is called *koumiss*, which is a sort of wine made of fermented mares' milk; and is carried by them from place to place, in bags made of horses' hides. When in perfection, the taste of koumiss is said to be a pleasant mixture of sweet and sour; but it is necessary to agitate it before it is drank. This preparation is also considered of great utility in a medicinal view.

The skin of the horse, after it is tanned, is made into collars, traces, and other parts of harness; and under the name of *cordovan* is also used for shoes. The hair forms a considerable branch of trade. That of the tail is employed for weaving the covers or seats of chairs and sofas; for making sieves, fishing lines, and the bows of musical instruments. The inferior hair of the tail and mane is employed for the stuffing of bolsters and mattresses. For this purpose it is baked, which renders it one of the most elastic substances for couches that are known. The short hair of the horse is used for stuffing saddles and horse-collars.

If horses be well treated and properly attended to, they will sometimes live to the age of fifty years: but during great part of this time they are generally so decrepid, as to be unable to perform any services whatever for their owners. To ascertain the age of a horse, reference is generally had to the teeth. Deeply sunk eye-pits are usually considered a criterion, though not an infallible one, of an old horse; and for colts or young horses, attention must be paid to the appearance of their coat, and of the hairs of the mane and tail, as it is not until they have changed their first teeth that any correct judgment of their age can be formed from the mouth. The deceptions of horse-dealers in changing the appearance of the teeth, and in various other particulars relative to the horse, render great caution necessary in the purchase of these animals.

In the breeding of horses, sound and well shaped animals ought to be selected with particular care; as the strength and excellence of the race entirely depend on this circumstance. For *elegance* the Spanish and Italian breeds are preferable; but, for the more useful purpose of *draught* those of Britain, Normandy, and Holstein, are the most esteemed.

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* Four inches make a hand. This is the usual mode of estimating the height of horses.

The females, or mares, bring forth one colt, after a gestation of eleven months: none of the parent creatures should be under four years of age. Castration is commonly performed when the colt is twelve or eighteen months old; but the most general, and we believe, the best practice is, to delay that operation till the animals attain the age of at least two years; for they will then retain a greater degree of strength and spirit. If properly kept they live to the age of forty years; but mares do not breed after eighteen, and stallions are useless at the age of twenty, so that they are fit only for the harness.

The horse being an animal of extensive utility, the most proper and least extravagant manner of feeding and keeping him becomes an object of considerable importance. Hence, potatoes, carrots, furze, cabbages, &c. have been successfully tried as substitutes for oats, and the more expensive method of *corn feeding:* where, however, grain is used, the most economical way will be to boil, and give it in a cool state to the animals, together with the liquor; by which simple means one half may be saved. Carrots are particularly serviceable, as broken-winded horses, when fed on these roots, speedily recover. A considerable reduction may also be made, by cutting the hay into a kind of chaff, and mixing with it straw, or the broken ears of corn, which arise in dressing grain; and also by *soiling* horses with lucerne, tares, or clover, instead of turning them out to grass in the summer; for, if they be well littered, the dunghill will nearly repay the expense of their maintenance. See also the articles FURZE, and LINSEED.

The management of horses, after having performed the labour of the day, is a matter of equal moment with their feeding; and, as considerable expense has injudiciously been incurred, by erecting elegant stables, we propose the following practice to the consideration of the rural economist. It consists simply in forming a small yard provided with a shed that is open in the front and furnished with racks, as well as a pump and cistern placed in one of the corners. A superstructure of this kind, if well littered, is in every respect preferable to a stable, and will preserve horses in better health, without requiring any other currying or dressing, than is usually given by farmers' servants. The utility and convenience of such a yard have been fully evinced by a patriotic nobleman, the Earl of DARLINGTON, who has followed this practice with great success for several years, and observed, that horses thus managed, not only are more healthy than in stables, but at the same time able to work well, even after the age of twenty years. [Stables injure horses' eyes.—T. C.]

The long-contested question, whether oxen or horses are preferable for agricultural purposes, we shall not venture to decide; though it will be useful fairly to appreciate the advantages, as well as the disadvantages, which attend the maintenance of either.

Oxen will draw the plough on tough clay soil and hilly lands, while horses stand still; but on even and light ground, the latter not only work faster than oxen, but are incomparably more active for carriage. It deserves, however, to be remarked, that oxen may be maintained at a very small expense. The price of *two* horses is computed to be equivalent to that of *nine* oxen; the food of the latter, during summer, consists merely of *grass*, and in winter of *straw*, on which provender they may perform moderate labour; and, when worked hard, they are allowed a little *hay*. On the contrary, the food of a horse generally is hay, oats, beans, &c. The number of cart-horses constantly employed in Great Britain, is calculated at 500,000; 300,000 of which are allowed, by the most competent judges, to be superfluous. These consume daily, upon an average, during nine months in the year, one peck of corn each; which amounts to sixty-three bushels each per annum; that is, (allowing one quartern loaf per week to every person, and computing only 12 loaves to the bushel) as much corn as will support seven persons; so that 300,000 superfluous cart-horses, moderately fed, require for their support a quantity of corn sufficient to maintain 2,100,000 persons! which number, if the inhabitants of Great Britain amount to ten millions, is nearly one-fourth part of the whole population.

To invalidate this statement, it has been objected, that though oxen may be maintained at a less expense than horses, yet the latter are far preferable, as they perform their work with much greater alacrity; and that the extra ploughing which a pair of horses will accomplish in one week, will fully pay the balance of keeping. Such is the difference of opinions, in the communication of which we have strictly adhered to facts; yet it ought in justice to be added, that an ox improves in value 2*l.* per annum, upon an average, from the time he is used and fed as an *ox;* and, when fattened, affords good and wholesome meat; while a horse progressively declines till he, literally, "is of no value." This subject shall be renewed under the article Oxen.

Independently of the important services which the horse renders mankind by his labour, his dung affords an excellent manure.

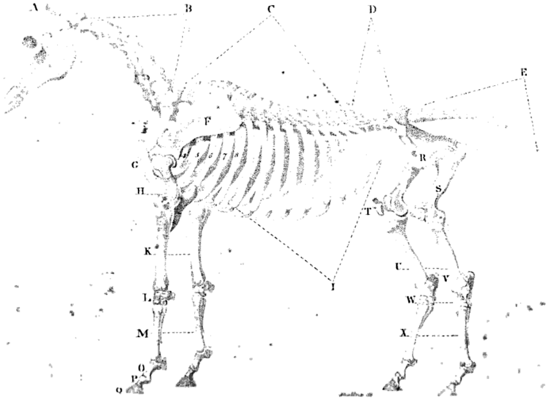
The urine, or stale, of these animals, likewise furnishes an excellent fertilising liquor, if preserved with the brine, suds, &c. of the house: some caution, however, is necessary in applying it to the soil.

Horse urine is equally beneficial to all lands; but it should be previously diluted in a proper vessel, with half the quantity of *pond-water*, and in that state poured on the ground. Thus the great heat of this manure, which, in particular seasons, is apt to burn some crops, may be easily corrected.

As the utility of horses exceeds that of all other domestic animals, we shall subjoin a few characteristic marks, by which their general qualities may be ascertained, and some of the numerous frauds committed by grooms, jockies, &c. opportunely prevented.

In old horses the *eye-pits* are generally deep: this mark, however, is very uncertain, as it is also found on young animals descended from aged stallions. But the most certain criterion is that derived from the teeth, the number of which amounts to 40; namely, 24 grinders, or double teeth, 4 tushes, and 12 fore-teeth; these last are the surest guides for discovering the age of a horse. They appear about 12 days after the colt is foaled; are round, short, not very solid, and successively cast and replaced by others. When two years and a half old, the two middle fore-teeth in the upper jaw, and those in the lower jaw, are cast: in the course of another year, four others drops out, one on each side of the former. At the age of about 4½ years, the horse loses four others, and always next to those which have already fallen out and been replaced. These four foal-teeth are succeeded by four others, but do not grow so quickly as the eight first, and which are called *corner-teeth.* They replace the four last foal-teeth, and are the chief marks by which the age of a horse may be ascertained: they are the third, both above and below, counting from the middle of the jaw, being hollow, and having a black mark in their cavity. When the horse is four years and a half old, they are scarcely visible above the gum; and the cavity is very sensible: in the course of a year and a half, they begin to fill; and the mark continually diminishes and contracts, till the animal attains the age of seven or eight years, when the cavity is completely filled, and the black spots disappear. These teeth cease to afford any knowledge of a horse's age, after eight years, when it is ascertained by the *tushes*, which are the four teeth next to those last mentioned, and which, like the grinders, are not preceded by any other teeth. The two in the lower jaw usually begin to shoot at 3½ years; those in the upper jaw at 4: and both continue very sharp pointed till the animal is 6 years of age. At 10 years, the teeth in the upper jaw appear blunted, worn out, and long; the gum contracting in proportion to the increasing years; and the more exposed the teeth are, the greater is the age of the horse. From 10 to 13 or 14, little can be perceived to determine the age; but at that time of life the upper teeth seem blunted, the gum contracts, and these useful bones are left bare. In proportion, therefore, to the greater or less degree of these marks, the age of a horse may be determined; and likewise, though not perhaps with equal accuracy, by the bars in the animal's mouth, which decrease as he advances in years. On this occasion, it will not be useless to point out an odious practice, of which many ostlers and stable-keepers are guilty, especially towards the horses of strangers. When provisions are at an exorbitant price, those inhuman monsters have sometimes the cruelty to mix a few leaves of the bird-cherry among the hay, or to rub the fatigued animal's teeth with tallow, or soap: in either case, it will obstinately refuse food, and not eat, till the hay is changed, or the teeth have been properly scoured with common salt.

In a horse that is free from blemish, the legs and thighs are well shaped; the knees straight; the skin and shanks thin; the back sinews strong and firm. The pastern joints should be small and taper, and the hock lean, dry, and not puffed up with wind. With respect to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the hoof itself, the coronet ought to be thick, without any tumour, or swelling; the horn bright, and of a greyish colour. The fibres of a strong foot appear very distinctly, running in a direct line from the coronet to the toe, like the grain of wood. Such a foot, however, ought to be kept moist and pliable; as it is subject to fissures and cracks, by which the hoof is sometimes cleft through the whole length of the coronet. A *narrow* heel is likewise a great defect: and, if it do not exceed two fingers in breadth, it forms an imperfect foot. A *high* heel often causes a horse to trip and stumble; while a low one, with long, yielding pasterns, is apt to be worn away on a long journey. On the other hand, a foot disproportionately large, renders the animal weak, and clumsy in its gait.

The head of a horse ought to be small, and rather lean than fleshy; his ears should be erect, thin, sprightly, and pointed; the neck arched towards the middle, tapering gradually toward the head; the shoulders rather long; the withers thin, and enlarge by degrees as they extend downwards, yet so as to render his breast neither too gross or too narrow. Such are the principal characters, by which the best form and proportion of that useful animal may be determined. Those of our readers who wish to obtain more extensive information relative to this interesting subject, may with advantage peruse *Ten Minute's Advice to every Gentleman going to purchase a Horse*, &c.; a small work, but which is replete with practical information.

The very imperfect knowledge generally prevalent, of the anatomy of this truly noble animal, has induced the editor to give an engraving of the skeleton of the horse, from Blaine, the latest writer on the subject.

The skeleton of the horse is divided by Blaine, into head, trunk, and extremities:

Explanation.

A Bones of the head.
B 7 Vertebræ of the neck.
C 18 Dorsal Vertebræ.
D 6 Lumbar Vertebræ.
E 18 Bones of the tail.
F The Scapula or shoulder-blade. The spire dividing the fossæ is represented by the plain surface.
G The Sternum or breast bone.
H The humerus or bone of the arms, its head articulates with the shoulder blade.
4 5 6 7 8 The eight true ribs so called, their cartilages being connected with the breast bone.
I The false ribs so called from their cartilages not being inserted into the sternum, but into each other.
K The leg bones.
L the knee, formed of seven bones.
M the shank bones to which are joined, two imperfect shank bones, on the back part, called by the French Epineux.
N Two triangular bones fixed to the back and upper part of the great pasterns forming the fetlock.
O Great pastern bones.
P Little pastern bones.
Q Coffin bones.
R Pelvis, or hip bones.
S Thigh bones.
T Stifle, or knee bone.
U Hind leg bones.
V Heel of the hock.
W Oslets, or small bones of the hock.
X Instep bones.

An attention to the improvement of the breed of horses in the United States, is a matter of great consequence. Our countrymen appear to be aware of this, and have of late imported some valuable horses: but it is still to be regretted that the country is filled with a set of worthless stallions, possessing no prominent good quality, from which an imperfect race is propagated, to the great injury of the general interest.

The following observations on this interesting subject are taken from a pamphlet published in Philadelphia in 1795.

"It is the union of a pedigree possessing particular qualities, with a stranger, also possessing some good property, which gives perfection. By a strict attention to this principle, the English have greatly improved their breed within a few years past. They commonly distinguish horses into four kinds

1 The race horse.

2. The hunter, uniting force with speed and spirit.

3. Coach horse, to draw light weight with agility, and to figure in cavalry.

4. Cart or draught horse.

The race horse is the offspring of a Barbary or Arabian horse, and an English mare of the first blood.

The hunter is the offspring of the race horse, and a mare three quarters blood, but more strongly limbed than the former.

The coach horse is the offspring of a hunter and a mare still more strongly limbed than the hunter, and half a degree less in blood.

The draught horse is the offspring of a coach-horse, and the strong country mare.

This distinction of the different classes of horses, arises from physical causes, and we seldom find them employed for any purpose but that for which they are naturally fit, unless they are rendered inadequate by age or accident; as it is well known that a saddle-horse requires a different character from that of the draught, and that the same qualities are not adapted to swift and slow motion, or to drawing heavy or light loads.

Those who wish for good horses should pay the utmost attention to the geneology of both sires and mares; the leading qualities of both should be ascertained, for, imperfections as well as perfections are transmitted to their posterity.

The race horse breed, is only a source of expense and distress to the owner, and should not be encouraged. The hunter deserves the preference; his beauty is perfect, the mode of training simple, and he demands no other attention, than that which reason prescribes. In peace he contributes to the pleasure of his owner, and in war he preserves his rider by his speed and spirit. When unfitted by age for the saddle, he answers for a coach-horse. To succeed in propagating this valuable species of horses in the United States, we must be particular in our choice of stallions, and attend to, 1. Their breed; 2. Their make; 3. Their leading character.

The breed ought to be well known; the half blood answers very well.

When the pedigree is ascertained, and he is found free from hereditary defects, as spavin, short breath, sore eyes; his figure, proportion, strength and character should be examined. The preferable kind, is the lofty, stout horse, light but not gigantic, fine figure, small head, short ears, bold front, a brown full eye with little black spots, within prominent and high; fore legs thick and broad from the shoulder to the knees, and from the knees to the joints next to the foot, lean and flat; joints thick and short; hips broad and square, *buttocks large and fleshy; hams broad.*

It is on this construction, that the perfect equilibrium of this fine animal depends: when he walks or trots, he should carry his fore feet in a perpendicular direction before him, without turning them either in or out, or rising them too high, which occasions a loss of time: the hind feet should exactly replace the fore, for if they spread, it makes him overreach himself, and occasions him to strike his hinder hoofs against his fore heels.

The mare should not have high bones, her ribs should be round, body long, and loins large. The sire and dam being matched, their leading qualities must be ascertained.

A heavy, cold, slow mare should be joined with the fire and action of the southern horse; and on the contrary, two fiery spirits must not be united. A horse should cover but once a day, and stimulating drugs entirely avoided.

April is the best month for a mare to foal, on many accounts. Eight days after bringing forth, the stallion must be presented to the mare, and if necessary, the presentation should be repeated. Common mares may be continued in use, with safety and advantage, till some weeks before they foal. When near their time, they should be confined to a certain regimen of food, in order to avoid overloading the intestines, and thereby retarding their delivery. After foaling, the pasture should be rich, or in defect of that, short feed should be given, such as broken Indian corn, or coarsely ground oats or beans. Horses reared in marshy shady meadows never thrive."

The general opinion of breeders has been, agreeable to the advice above given, respecting the crossing of the breed: and a decided testimony in favour of it has lately been given by Mr. A KNIGHT, in the *Transactions of the Royal Society*, London, 1799, part 2d; and yet it is well known that the celebrated English breeder, BAKEWELL, did not accede to the opinion, but always bred from his own stock, until he procured another, the qualities of which he wished to propagate, and unite to those of his own.

The proper mode of shoeing horses, being an affair of great consequence, and as little understood by the greater part of those who own horses, as by the blacksmith; ample directions shall be given on the subject, taken from the late excellent work, by Mr. E. COLEMAN, professor of the *Veterinary College, London*, entitled, "*Observations on the Structure, &c. of the Foot of the Horse*," London, 1798.

The whole of the hoof is composed of horny fibres, without sensation. The crust or wall surrounds the anterior and lateral parts of the foot. It is the only part that can receive nails without mischief, is thicker at the toe than the quarters, and generally thicker at the outer than at the inner quarter. The union of the crust with the coffin-bone sustains the weight of the animal. The horny soal is concave on the outside, beginning at the junction with the crust, and increasing as it advances towards the centre, so that the edge of the sole, united to the crust, is least concave.

The bars or binders are two in number, and are placed between the frog and sole; and at the heels, form a broad solid junction with the crust. Their use is to keep the heels expanded. In a *natural* hoof there are two large cavities between the frog and bars.

The frog is an insensible body, placed in the centre of the sole, of a wedge-like form, pointed towards the toe, and expanded as it advances to the heels. In the centre of the broad part there is a fissure or separation.

The practice of shoeing very much depends on the functions of the frog being understood. As its convexity must make it liable to touch the ground at every step, we conclude it was intended to receive pressure. Paring the frog therefore, and raising it from the ground by a thick heeled shoe, annihilates its functions, and produces disease.

Common practice of shoeing Horses, and its consequences.—Before any shoe is fitted to the hoof, the bars are totally, and the frog partly removed by the butteris. The removal is termed opening the heels; when the hoof is thus prepared, a shoe is applied thicker at the heel than at the toe, broad in the web, having its upper surface convex, and four nails placed in each quarter. The high heels of the shoe prevent the frogs from embracing the ground, and the concavity of the shoe at the quarters, and the nails (that are placed near the heels) will confine the growth of the crust, and contract the hoof.

Practice of shoeing Horses, which preserves the foot in health.—The first thing to be attended to, is to take away a portion of the sole, between the whole length of the bars and crust with a drawing-knife. The heels of the sole cannot receive the pressure of the shoe, without corns. The sole must be made concave, and not allowed to come in contact with the shoe. The heels of the shoe should be made to rest on the junction of the bars with the crust, but if the bars be removed, then the shoe is supported by the crust only, and not by the solid broad basis of crust and bars united. When the shoe is applied, the cavity between the sole and shoe, should be large enough at every part to admit a large horse-picker, and particularly between the bars and crust. If a picker cannot be admitted, then it is requisite to make either the sole or the shoe concave.

The bars and frog should never be removed, but ragged parts of the latter may be cut away. Where the heels are higher than the frogs, lower the heels by a rasp or butteris, for in *every case we are to endeavour to bring the frog in contact with the ground.* Nevertheless, where the frog has been disqualified for its functions for a considerable period, and become soft, it must be accustomed to pressure by degrees. Thus at every time of shoeing, the hoof may be lowered about the tenth of an inch, until the frog be hard, and equally prominent with the heels; or if the horse be not required to work, great advantages will be derived from standing without shoes on hard pavement.

By reducing the heels of the shoe, in the same proportion as the hoof grows, a thin heeled shoe, may, in a few months, be employed; and yet the horn being preserved at the heels, and cut at the toe, every time of shoeing, the heels (shoe and hoof together) will be as high, and frequently higher, than when the former thick-heeled shoes were applied. The crust that descends at the heels, we allow to remain, but subtract an equal quantity of iron from the heels of the shoe, and as much horn as possible from the toe of the hoof. This system should be continued, until the heels of the shoe are about one-third the thickness of the toe.

But as the feet of horses are so variously deformed by bad management, it will be requisite, in shoeing, to attend to each particular kind of hoof. If any form of shoe be indiscriminately employed for all kinds of feet, it must frequently fail of success, but by attention to the different hoofs, we can generally improve the whole foot so as to adapt the shoes here recommended, with advantage.

The shoe must be varied in its length, breadth and thickness at the heel, and surface, according to the hoof. If the heels of the fore feet are two inches and a half, or more in depth, the frog sound and prominent; then only the toe of the hoof requires to be shortened, and afterwards protected by a short thin-heeled shoe. A common sized saddle-horse shoe, may be about three eighths of an inch thick at the toe, and one-eighth at the heel. But unless the hoof has been properly preserved, the heels and frog are generally too low to receive the short shoe. The toe of the hoof requires to be shortened as much as possible, but if the frog touches the ground, no part of the heels should be cut. During the wet months, we protect the whole crust by a long shoe; and if the heels of the hoof are low, we employ the same shoe in summer.

Young horses with perfect feet, that have never been shod, or horses taken from grass, do not always admit of horn being taken from the toe; and where only a small quantity of the toe of the crust can be removed, the heels of the shoe should not at once be made thin, as a temporary lameness may ensue. But if the crust can be removed at the toe, nearly in the same degree as the part is to be covered with iron, and if the frog be sound and prominent, then a thin-heeled shoe may at once be employed with success.

A shoe and nails for a moderately sized coach-horse, should weigh from 18 to 20 ounces. A saddle horse-shoe with nails, about 12 or 14 ounces; width at the toe six-eighths of an inch, but one-fourth less at the heel. The toe of the shoe may be three-eighths of an inch thick on the outside; the inside of the toe and the heel one-eighth. Some little variations will be occasionally requisite.

The shoes of cart-horses should be three times thicker at the toes than at the heels, provided this quantity is not worn out before the toe.

In general the heels of the short shoe, should terminate about three-fourths of an inch from the heels of the crust (see the plate), but the heels of the long shoe should rest on the junction of the bars with the crust, behind the seat of the corns. The length of the shoe commonly employed, is between both; the heels are generally opposite the seat of corns, and the length of the shoe contributes to produce the disease. The shoe when first applied, is adapted to the hoof, but before the expiration of the month, the hoof descends, is expanded, and frequently becomes too large to fit the shoe; and then the heels of the shoe, that were at first equal with the crust, press upon the horny sole, bruise and inflame the sensible sole, and occasion corns. The short shoes are not allowed to approach the seat of corns; and then the heels of the sole having great freedom of motion, this disease is prevented. And where long shoes are properly employed, if the heels rest on the junction of the bars with the crust, and if the sole between the bars and the crust is removed, corns are equally avoided.

The shoe mostly recommended by the Veterinary College, is partly flat, and in part concave, on its upper surface. The flat portion of the shoe, is intended to rest only on the crust, while the concavity of the shoe is supposed to be opposite the sole, and the nails are placed in the centre of the seat, or flat part of the shoe. The principle of this shoe, is to prevent any part of the sole from receiving pressure, and to oblige the crust to support the whole weight of the animal.

If the whole of the sole be sufficiently thick to admit of being concave, then the whole internal surface of the shoe may be made flat. But where the sole towards the toe is convex, or flat and very thin, a shoe altogether flat, or a flat seat, with the nails in the middle, cannot be applied, without improper pressure. But I have scarcely ever seen an instance, where the sole could not be removed, the first or second time of shoeing, between the whole of the bars and the crust.

For flat soles, the form of the shoe is concave at its upper part, opposite to the flat or convex portion of the sole, with a narrow surface, only equal to the crust and nails; but at the quarters and heels, where the sole can be made concave, there it is necessary to employ a flat surface. If the bars and sole at the heels have been destroyed by the farrier, so as to prevent the possibility of making a concavity between the bars and the crust, and if the horse be obliged to work, then it will be necessary to employ a bar shoe to rest on the frog, and raised from the sole at the heels. But where the sole can be preserved only for a few weeks, it will grow sufficiently to be made concave with a drawing-knife between the bars and crust, and then the heels of the shoe may be flat, without touching the sole.

The best form for the external surface of the shoe, is a regular concavity; that is, the common shoe reversed.

The nail holes, and the nails, are stamped with a punch of a wedge-like

Fig. 1.

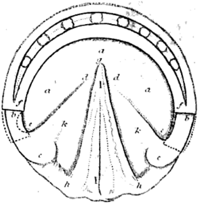


Fig. 2.

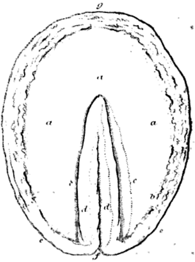


Fig. 3.

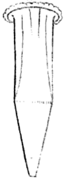


Fig. 4.

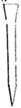
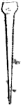


Fig. 5.



form (see the plate), and the heads of the nails are of the same figure, namely conical, and received into the nail holes; and then so long as the shoe remains, so long there are heads to the nails.

The shoe should be nailed all round the toe of the crust. The toe is by much the thickest part of the crust in the fore hoof,[*] and therefore capable of receiving nails, with less danger of wounding the sensible parts within, than at the quarters, where the crust is generally thin, and by preserving the greater part of the quarters free from nails, the heels are allowed to expand.

About one inch and a half of the heels of the shoe may be generally left without nails: but on a bar shoe, the nails should be carried nearer the quarter on the outside, than the common shoe, or it will be liable to be detached from the hoof.

When a horse cuts, the outer quarter of the crust should be lowered, and the interior quarter preserved. But when the sole is thin, the inner quarter of the shoe should be thickened, and the outer quarter made thin, which will produce the same effect as altering the horn. If the toes of the hoof turn in, the inner quarter of the hoof only, should be lowered, and the outer quarter of the shoe made thicker than the inner quarter.

Explanation of the plates.

Fig. 1. A view of the natural hoof of the horse, being of a circular form, and shod with a short shoe.

a a The external surface of the sole, of a concave form.

b b The inferior edge of the crust at the heels.

c c The junction of the bars with the crust.

d d The point of the bars.

e e The sole between the heels of the crust and bars, the seat of the corn.

f f The heels of the short shoe, not allowed to reach the seat of the corn at e e.

g The toe of the frog.

h h The heels of the frog.

i i The cleft between the heels of the frog, the external seat of thrushes.

k k Two cavities between the sides of the bars, and the sides of the frog.

A hoof shod with a long shoe, would extend to e e, and if there be a corn on the foot, a semicircle must be cut out of the shoe, directly over it, to prevent pressure from the shoe.

Fig. 2. View of the hoof, with contracted heels, produced by the common method of shoeing.

a a a The sole.

b b The original seat of the bars.

c c The seat of the original cavities, between the bars and the crust, but now, from contraction, solid horn.

d d The frog very much compressed by the contraction of the heels of the crust.

e e The width of the hoof at the heels, not being more than one half of its length, from f to g.

f The extremity of the heels of the frog.

g The toe of the crust.

Fig. 3. A punch with a wedge point to make the nail holes.

Fig. 4. A nail with a wedge head, of the same form as the point of the stamp.

Fig. 5. A nail with a common head.

HORSE-CHESNUT, or *Æsculus*, L. See Chesnut.

HORSE-FLY, or *Hippobosca*, L. a genus of insects, comprising four species: the principal of these is the *equina*, or Common Horse-fly, which equally torments horses and cows.

The horse-fly is broad, flat, shining, and apparently covered with scales; its head, breast, and belly, are of a yellowish colour, streaked with brown. These insects are very difficult to be killed, on account of the hard scaly wings with which they are covered; and so firmly do they adhere to the poor animals, that these can neither rub nor bite such pernicious vermin off their skin, without severely wounding themselves. Hence the only preventive we can devise, is a net for covering the horse in hot weather, or in travelling through woods, or such places as are infested with these troublesome flies.

HORSE-MEDICINES, an appellation given to such drugs as are prepared exclusively for the use of horses, in particular disorders. As many accidents happen from the ignorance of pretenders, we shall offer a few hints, together with recipes, that may be useful in ordinary cases.

I. Purges are frequently rendered necessary in full grown horses of gross habits, for disorders of the stomach and liver; they ought, however, to be administered with great caution, and their strength proportioned to that of the animal; for, as these medicines frequently continue 22 hours in the body previously to passing off, they are apt to cause gripes, accompanied with excessive cold sweats, and to occasion inflammations, which frequently terminate in gangrene and death.

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[*] In the hind feet, the quarters and toe are nearly all of the same substance.

Purges ought to be given early in the morning, upon an empty stomach; three or four hours afterwards, the horse should be fed with scalded bran, when a little hay may be allowed him. All his drink ought to be lukewarm, and a little bran should be mixed with it; but, if he refuse this mesh, pure water may be given. While the dose is operating, the animals should swallow copious draughts of warm water; or, in case of refusal, be indulged with cold drink, in order that the purge may pass off the more speedily.

The following preparations are extracted from those, the character of which is established among sportsmen, for their utility on sudden emergencies.

1. Take from 10 to 12 drams of aloes; of myrrh and ginger, each half an ounce; of saffron half a dram; or, if botts are suspected, add one scruple (20 grains) of calomel, or fifteen of red precipitate.

2. Let 10 drams of Socotrine aloes: half an ounce of myrrh finely pulverized; one dram of saffron, and a similar quantity of fresh jalap, both in powder, be well mixed together, and formed into a solid ball, with the addition of molasses.

3. Infuse two ounces of senna in a pint of boiling water, with three drams of salt of tartar, for two hours; when it is to be poured off, and four ounces of Glauber's salt dissolved in it, together with two or three ounces of cream of tartar. This preparation is reputed to be cooling, easy, and speedy in its operation; it is preferable in cases of sudden inflammations to any other dose; as it is said to pass into the blood, and also to operate by urine.

The following cathartic balls are recommended by Mr. Taplin; and the ingredients of which they consist, are proportioned to the age, strength, size, and constitution of different horses.

1. Socotrine aloes, one ounce; rhubarb, two drams; jalap and cream of tartar, each one dram; pulverised ginger, two scruples; oil of aniseed, twenty drops; and as much molasses as will form the whole into a ball.

2 Socotrine aloes, ten drams; rhubarb, jalap, and ginger, each two drams; cream of tartar, three drams; and a sufficient quantity of molasses to form the ingredients into a ball

3. Barbadoes aloes, nine drams; jalap, Castile soap, and cream of tartar, of each two drams; ground ginger, one dram, and the same proportion of molasses as above stated.

4. Barbadoes aloes, ten drams; Castile soap and jalap (in powder), of each half an ounce; cream of tartar and ginger, each two drams; oil of aniseed, forty drops; these are to be formed into a ball, with syrup of any kind.

In preparing these balls, it will be requisite to give them an oval form; but, if they exceed the size of a small hen's egg, they ought to be divided into two doses, and dipped in oil, in order that they may pass the more easily down the horse's throat.

II. Clysters are of considerable service, in relieving the animal from various acute complaints: hence they should be carefully administered lukewarm. Their composition ought to be extremely simple, so that they may be easily prepared, and given on sudden emergencies.

Clysters are distinguished by various names, such as emollient, laxative, diuretic, &c. of these we shall specify such as may be speedily procured, together with the cases in which they may be resorted to with advantage.

1. *Laxative Clyster.* Let two or three quarts of thin water-gruel be mixed with eight ounces of Glauber's salt, to which are to be added, six ounces of sweet oil.

2. *Emollient Clyster.* Take two or three quarts of thin water-gruel, six ounces of coarse sugar, and a similar proportion of salad oil. The whole is to be well mixed, and injected lukewarm. These two preparations will be fully sufficient to promote a free discharge in sudden obstructions, inflammations, &c.; they are, in general, fully as efficacious as the more costly compounds.

3. *Purging Clysters.* Infuse two ounces of senna in boiling water; after having stood a sufficient time it is to be strained, and half a pint of molasses, with an equal quantity of salad-oil, are to be carefully incorporated with it. This will operate more speedily than either of the preceding mixtures, and is therefore preferable, when immediate discharges become necessary.

Another. Common salt a small handful lamp or sweet oil a pint, molasses a pint, water one quart, inject by means of a large pewter syringe. This remedy is highly useful in cases of over-feeding, and should be repeated every half hour, until the bowels are fully evacuated.

In case of sudden or apprehended inflammations in the bowels, the following is the most proper:

4 *Anodyne Clyster.* It consists of one pint of the jelly of starch, or infusion of linseed, and one ounce of liquid laudanum, properly mixed, and immediately administered: if the symptoms increase, from 30 to 40 grains of opium may be substituted for the laudanum, according to their urgency.

5. *Nourishing Clyster.* Three quarts of thick water-gruel, with two or three table-spoonfuls of honey. When clysters of this kind become necessary, they ought to be given four or even five times in the course of a day, as circumstances may require. They are very serviceable in cases of locked jaw, inflammations of the throat, &c.

6. *Diuretic Clyster.* Take Venice turpentine, two ounces; Castile soap, one ounce. These are to be well beaten up with the yolk of two eggs, and then diluted with two quarts of warm water. Such a clyster is of great service in the stranguary, and all obstructions of the uriary passages: if speedily administered, it seldom fails to afford complete relief.

These few clysters are amply sufficient for common exigencies; and, with a few alterations, which every skilful person is able to adopt, will answer almost every purpose.

Diuretic mash. Dissolve half an ounce of *salt petre* (nitre) in a quart of strained flaxseed tea, and mix it with bran for his food.

III. POULTICES are of such utility, as to deserve a place in this collection. We shall, therefore, subjoin two preparations which may be safely applied in cases of accidental wounds.

1. *Digestive Poultice:* Take such a quantity of oat-meal or coarse wheaten flour, and beer-grounds, as may be required on the occasion: with these are to be mixed common turpentine and hog's lard, one ounce of each, previously melted together, and the whole boiled to the consistence of a poultice.

2. *Emollient Poultice:* Take half a pound of oat-meal, or coarse wheaten flour, and a similar quantity of pulverised linseed. These are to be boiled in milk or water; to the consistence of a cataplasm, when one ounce of sal-ammoniac in powder should be added. The emollient poultice may be applied to wounds attended with great heat, inflammation, or swelling: by the addition of fresh butter, lard, or oil, it may be rendered more relaxing, so that it will speedily remove the tension of the skin, while it attenuates the viscid and obstructed juices.

IV. POWDERS. The chief powder employed in farriery is that of *Diapente;* which consists of equal quantities of gentian, bar-berries, myrrh, the shavings of ivory, and round birthwort (*Aristolochia rotunda*, L.) These are to be carefully pulverised, sifted, and weighed, so that the exact proportions be mixed; after which they are to be kept perfectly secluded from the air. This powder generally forms an ingredient in other medicines, and is of considerable efficacy in the FARCY (which see): it is likewise mixed with muscadine wine, sack, or ale, and given as a kind of diet-drink to horses affected with colds, coughs, inflammations in the blood or liver, and various other affections: as it tends to purify the humours, and to clear the bowels of infectious or corrupt matter. The last class of medicines that deserve attention, are:

V DIET DRINKS, which are generally used in cases of surfeits, or similar disorders; for this purpose, the following recipes may be useful:

1. *Lime-water*, prepared with shavings of sassafras and liquorice, is well calculated to purify the blood, and may occasionally be given, together, with balls consisting of pulverised salt-petre, mixed with honey; so that two or three ounces of nitre be taken in the course of twenty-four hours.

2. *Tar-water* may in many cases, and especially when the appetite is impaired, be administered with advantage; but let it be remembered, that all medicines of this nature ought to be continued for a considerable time, in obstinate maladies; for, otherwise, there will be no chance of success.

Lastly, as many diseases of the horse arise from obstructed perspiratien, in consequence of his being suffered to stand in the stable, and become cool after fatiguing labour, we can from experience recommend a mesh, consisting of two or three gallons of lukewarm water, in which half a pound of honey is dissolved, with the addition of a few handfuls of barley-meal, or malt dust: such a draught ought to be allowed morning and evening, for several days, whenever it is apprehended that the animal has taken cold, or been otherwise injured by violent exertions.

For Sore Eyes. Dissolve half an ounce of sugar of lead in a quart of water, and bathe the eyes frequently with a linen cloth dipped therein. When the inflammation has subsided, and the eye continues to run from weakness, add one-fourth of an ounce of white vitriol to a pint of the above water. For other diseases see the several articles.

Under art. HORSE it was intended to treat of the *best draught of horses or oxen*, but in order to make this article more complete, it must be deferred until we come to the article WHEEL-CARRIAGES.

HORSE-RADISH, or *Cochlearia Armoracia*, L. an indigenous perennial plant, growing on the sides of ditches, the banks of rivers, and other damp places; flowering in the month of May.

It has a strong pungent smell; a penetrating acid taste; and is refused by every kind of cattle. The root, when scraped, is much used at the table as a condiment for fish, roast beef, &c.; it is also employed for many other culinary purposes: and might, in times of scarcity, afford flour for bread. With this intention, however, the roots ought to be collected in autumn, and treated in the manner already described. See art. CASSAVA and CHESNUT. But, if horse-radish be intended for immediate use, it ought to be dug out of the ground *fresh*, only from October to March; or to be gathered in the spring, then dried, reduced to powder, and preserved in bottles closely stopped, for occasional use; when it should be previously moistened with spring water. When steeped and digested in vinegar, during a fortnight, this root is said effectually to remove freckles in the face.

In paralytic complaints, horse-radish has sometimes been applied with advantage, as a stimulating remedy to the parts affected. A strong infusion of it excites vomiting; and is greatly recommended by SYDENHAM in dropsies, particularly such as succeed intermittent fevers.

HORSE-TAIL, or *Equisetum*, L. a genus of perennial plants, comprising eight species, six of which are indigenous: of these the following are the principal:

1. The *Sylvaticum*, or Wood-horse-tail, which grows in moist woods, shady places in the vicinity of rivers, and on boggy soils: it flowers in the months of April and May. Horses eat this plant with avidity; and, in some parts of Sweden, it is collected for the purpose of serving them as winter food.

2. The *arvense*, Common, or Corn horse-tail, growing in wet meadows and moist corn-fields. It is a most troublesome weed in pastures, and is seldom touched by cows, unless pressed by hunger, when it occasions an incurable diarrhœa: it is eaten with impunity by horses, but is noxious to sheep. This rough grass is employed for cleaning and polishing tin vessels. According to GLEDITSCH, this species, as well as the *fluviatile*, or River-horse-tail, are of considerable service in tanning or dressing leather.

3. The *palustre*, Marsh-horse-tail, or Paddock-pipe, which flourishes in marshy and watery places; flowers in the months of June and July. It is not so strong as the preceding species, but is equally prejudicial to cows: farther, it is very troublesome in drains, within which it vegetates, and forms both stems and roots, several yards in length: thus the course of the water is interrupted, and the drains are totally obstructed. To remedy this inconvenience, the reader will consult the article DRAINING.

4. The *hyemale*, Rough Horse-tail, Shave-grass, Pewterwort, or Dutch Rushes, is found in marshy, watery soils, and flowers in the months of July and August. This species is wholesome for horses, by which it is eaten; but it is hurtful to cows, and disagreeable to sheep. It is chiefly employed by turners and cabinet-makers, for polishing their work; as well as by dairy-maids, for cleaning pails and other wooden utensils.

HORSE-WORM. See BOTTS.

HOSPITAL, a building properly endowed, or otherwise maintained by voluntary contributions, for the reception and support of the poor, sick, infirm, or helpless.

[Perfect cleanliness and ventilation are the great points to be attended to in all hospitals; which are mere reservoirs of disease when these points are not attended to.—T. C.]

HOT BEDS, in gardening, are made either with fresh horse dung or tanners' bark, and covered with glasses, to protect them from the severity of the wind and weather.

Where horse-dung is employed, a trench should be dug, of a width and depth proportioned to the size of the frames intended to be used; and which, in dry ground, ought to be a foot or a foot and a half, deep; but, if the soil be wet, it should not exceed six inches. The dung is then to be spread even and smooth on every part of the beds, laying the finer manure on the surface: if the bed be intended for planting out cucumbers, a hole should be made about ten inches broad, and six inches deep, in the middle of the place destined for each light, and then filled up with good fresh earth. The bed is next to be covered to the depth of four inches with the earth taken out of the trench, and the frame fixed over it, to remain till the earth become warm, which commonly takes place in the course of 3 or 4 days after the bed is made; when the cucumbers may be planted.

In case the hot-bed be designed for other plants, it will not be necessary to make holes in the dung; but, after levelling the surface, good earth ought to be spread over it, to the depth of three or four inches; the frames and glasses being put on as before. In making such beds, the dung should be settled close with a fork; and if it be full of long litter, it must be trod down equally in every part. In the first week or ten days after the hot-bed is made, the glass should be slightly covered, during the night, and cautiously opened in the day time, to give vent to the steam; but, as soon as the heat abates, the covering should be increased by mats or straw: and, when the bed becomes cold, fresh dung should be applied to its sides.

Hot-beds made with tanners' bark are preferable to those above described, especially for tender exotic plants and fruits; as they require a more equal warmth than can be produced by horse-dung. The method of making them is as follows: a trench is dug about three feet deep, if the ground be dry; but, if the soil be wet, it ought not to exceed the depth of a foot, and should be raised two feet above the ground. Their size must be in proportion to the frames intended to cover them; though they ought to extend at least 10 or 12 feet in length, and six in width. The trench should be lined with bricks on each side, to the height of three feet, and filled in the spring with fresh tanners' bark, which should be previously thrown up into a round heap, in order to drain for three or four days. When the tan is laid on, it ought to be gently beaten down with a dung-fork; for if it be trodden in, it will be prevented from heating, as it settles too close. The frame and glasses are now to be fixed; and, in the course of ten days or a fortnight, the bed will grow hot, when pots or plants of seeds may be plunged in it; care being taken that the bark be not compressed. These beds will preserve a proper temperature of heat for three or four months, which may be continued two or three months longer, by adding a load or two of fresh bark, as often as the warmth begins to decrease.

Frames vary in size, according to the plants they are destined to cover. If designed for ananas or pine-apples, the back should be three feet high, the lower part fifteen inches: when the bed is intended for taller plants, the frame must be made proportionally higher; if for seeds only, it will not be necessary to employ frames more than fourteen inches in height at the back, and seven in the front. Thus the heat will be increased, and the growth of the plants considerably promoted.

HOT-HOUSE, a building erected for the purpose of raising such exotic plants, as from their extreme tenderness, are unable to withstand the effects of a cold or variable climate.

The construction of hot-houses, in general, differs little from that of green-houses; because the design of both is to receive as much benefit as possible from the genial warmth of the sun, assisted by the heat artificially procured from subterraneous stoves and flues. We shall, therefore, at present, only give an analysis (from the 1st. vol. of the second series of *Recreations in Agriculture*, &c.) of the principle on which Dr. ANDERSON's improved hot-houses are constructed, and for which he obtained a patent.

He first points out the defects in the present method of erecting hot-houses; in consequence of which the heat of the sun is not employed with that advantage of which it is susceptible. In the prevailing mode of building these houses, the roof glasses are, with very few exceptions, laid into the frames, by folding one frame over the other, and thus leaving an open space between each pane; through which the air has a free passage, while the front panes are closely covered round with putty. This communication with the open air at the upper part of the house, is their chief imperfection; for the power of the morning sun is thus lost for several hours; and, in the evening, when the warm air within begins to cool, and to contract in bulk, the cold air from without rushes in through the top or roof-glasses, cools the whole house in the most expeditious manner, and thus counteracts the influence of the solar rays.

To remedy these inconveniences, the patentee proposes the following plan of construction, for houses designed to force vines, or such plants as require a similar temperature. The house is to be built of the usual dimensions, but with a glass roof perfectly flat; and, as it never requires to be opened, all the seams or junctures between each pane are to be carefully closed with lead and putty. Over this flat ceiling, another sloping roof is to be erected, and covered either with slate, or likewise with glass, which will better answer the purpose. The upper chamber, which will thus serve as a reservoir for the heated air, communicates with the common atmosphere only at its lower part, that is, immediately over the roof of the lower house; and there is a contrivance for another occasional communication with the latter, by means of a pipe or tube, that extends from the top of the upper chamber almost to the ground below.

By this construction, as soon as the sun expands the air in the lower house or chamber, a part of that air rises through the tube into the upper chamber; where it ascends to the top or roof, forcing out the cooler air contained in the upper chamber, which passes off through the openings left above the floor of this chamber, or in the roof of the lower room.

During the whole of this heating process, the vines, which are trained along, beneath the glass roof of the lower chamber, are surrounded with heated air. In the evening, when the influence of the sun is withdrawn, the warm air begins to cool, and consequently to contract its bulk; thus the external air rushes in, through the aperture immediately over the lower glass roof, into the upper chamber. This cold air being heavier than that within the house, it can only enter as the latter recedes; the current through both chambers is now exactly reversed; and the lower room receives all the warm air from the reservoir or upper one, before the cold can reach it.

Dr. Anderson is of opinion, that a few hours sunshine will at any time be sufficient completely to heat the house in which vines are planted; and thus, without any artificial heat from fuel, a permanent warmth may be maintained, which is sufficient to ripen grapes, in favourable weather, as early as in the months of June, July, and August. He farther suggests, that the upper chamber may be converted into an hot-house of inferior rank; and that it would be eminently calculated to serve as a substitute for a green house or conservatory.

Such is the outline of this very ingenious plan, and the inquisitive reader who wishes to acquire more minute information on this subject, will probably resort to the volume already quoted, where it is amply treated, and illustrated with cuts.

Dr. W adds the following account of a new plan in his supplement.

A glass frame for buildings of this description, has lately been invented by M. Benard: it possesses considerable advantages over those in common use. The lower part consists of a double square of glass panes set in wood, or in wood and lead. The upper part is composed of panes of glass fixed in wood, and terminates in an oblong six-sided prism; it may be taken off at pleasure, by a ring connected with the top. The whole of this fabric has the singular advantage of throwing a great body of light on the plants, while it prevents that sickly growth, denominated *etiolation*; and renders it easy to produce a variety of temperatures, as occasion may require. M. Benard's hot-house is supplied with heat, at a trifling expense, by common oil; the smoke of which is conveyed round the frame, by means of a flue.

Hot-houses are liable to be infested with a variety of insects known under the different appellations of *Cocci*, *Aphides*, (lice,) &c. that harbour in the walls, and among the trellises, which fasten up vines, and other wall-fruit trees, especially during the winter. In order to destroy these vermin, Mr. Speechley recommends the walls to be washed with common soap-suds early in the spring, while they are in a torpid state: this liquor is to be poured out of a watering-pot from the top of the wall downwards; and ought when used to be considerably warmer than new milk: thus, if the suds be properly and plentifully applied, the wall will assume a pale red colour, and the insects be effectually destroyed.

[Of late, in England, hot-houses are generally warmed by steam; and the warmth thus produced is more mild and uniform than the heat of flues. The steam is thrown into pipes which give out their heat.—T. C.]

HOUND, an appellation given to dogs of chase.

Hounds of the middle kind are deemed to be the best, being stronger than such as are either very small, or of a large size. The shape of these animals should be carefully attended to, as they can neither run swift, nor perform great tasks, if their limbs are not well proportioned. A good hound ought to have straight legs, round small feet, and well-formed shoulders; his breast should be rather wide than narrow; his chest deep; his back broad; his head small; his neck thin; his tail thick and bushy. Young animals that are weak from the knee to the foot, should not be suffered in the pack; and all the hounds should be nearly of a size.

Particular attention is requisite in the breeding of hounds. No old dogs should be admitted, nor should any attempts be made to cross the breed. The months of January, February, and March, are the best for breeding. As, however, this quadruped is less connected with purposes of economy than amusement, we shall content ourselves with referring the curious reader to Mr. Beckford's "*Thoughts on Hunting*," in which the subject is fully and perspicuously treated.

HOUND'S-BERRY. See Cornel-tree.

HOUND'S-TONGUE, or *Cynoglossum*, L. a genus of plants consisting of eight species, two of which are natives of Britain; the principal of these is the *officinale*, Common Great Hound's-tongue or Dog's-tongue, which is frequently found on road sides, and among rubbish; where it flowers in June. It is eaten by goats, but refused by sheep, horses, hogs, and cows. Its scent is very disagreeable, and resembles the odour of mice.

This plant has a bitter taste, and is so powerfully narcotic, that persons who had eaten it as a culinary vegetable, were laid into a profound sleep for 14 hours; and others died in consequence. The roots, however, were, according to Ray, employed by Dr. Hulse, who prescribed a decoction of them internally, and cataplasms externally in scrophulous cases.

The *Cynoglossum Virginianum*, is a native of the United States. The leaves, when used as tobacco to smoke, intoxicate. According to Clayton, the root is astringent, and is given in diarrhœas.

HOUR, a measure of time, equal to the 24th part of the natural day, or that space of time which the earth requires to perform its diurnal revolution round its axis. The hour is divided into 60 minutes, each of which is divided into 60 seconds, as every second is into 60 thirds. See Time and Watch.

HOUR-GLASS, a kind of chronometer, employed by navigators, as well as by some artisans and mechanics, to measure the passing of time, by means of the descent or running of sand, out of one glass into another.

The best hour-glasses are those which are filled with egg-shells, well dried in an oven, finely pulverised and sifted; as they shew the passing of time with greater exactness than common sand.

HOUSE, a habitation or edifice suited with conveniences for the abode of man.

Under the articles Architecture and Building, may be found some general observations on this subject, which deserve attention. At present, some additional instructions shall be given, as the result of much inquiry among practical men.

1. In the first place, it is of the greatest consequence to procure well seasoned timber for joists. Wood differs very much in durability, and yet the opinion of men whose judgment upon this subject is matured by repeated experience, authorises the assertion that the durability of any particular species of wood is not so much connected with the nature of it, as with its seasoning. Hemlock spruce, (*Pinus Abies Americana*) is a very perishable wood, if used when recently felled and sawed; but it is a fact, that young hemlock, free from wind shakes, duly seasoned, and not floated, will last as long as most other kinds of wood under similar circumstances. Mr. D. Evans, jun. of Philadelphia, an experienced builder, in altering his house, found a bond piece of hemlock sound, which he knew from the age of the house must have been at least 80 years old.

The former senate chamber in Congress Hall and the building erected for the president of the United States, and now occupied by the University of Pennsylvania, were striking instances of the perishable nature of unseasoned hemlock: but it is also a fact, that white oak, if unseasoned, will not last longer than hemlock when put into brick or stonework. Of this many facts might be produced. The necessity of attention to the timber is the more earnestly enforced, because, from the rapidity with which houses have been built in Philadelphia, for some years past, much timber, fresh from the saw-mill, has been put in dwellings intended by the owners to be durable, but which have already begun to decay, and will continue to rot. Some serious accidents will one day occur to rouse people from their inattention.

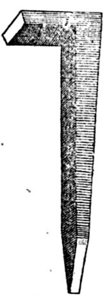
2. The thickness of the walls of a house is an object nearly of equal importance with that of the first article. Independently of the increased durability of a house, arising from thick walls, the consideration of our comfort ought to excite to improvement in that particular. Houses with thick walls are cooler in summer and warmer in winter. In Calcutta the walls of houses are nearly three feet thick, and the outsides are covered with a mortar called *Chunam*, (see CEMENT) whch reflects the heat, so that they are rendered cooler than many houses in the United States, notwithstanding the greater heat of the climate of India. In winter also, the quantity of fuel saved by the thick walls of a house confining the heat, must be obvious. The walls of most houses built in Philadelphia are much too thin, as they seldom exceed nine inches, and derive the chief part of their support from the adjoining houses. It is not unusual to perceive day-light through the walls of the garret of a house, a circumstance which must necessarily render these apartments uncomfortable at all seasons; but there is another disadvantage which ought to be mentioned: should the house take fire and the rafters of the roof be destroyed, the gable end for want of support will probably fall in, and endanger the lives of those who meritoriously risk their safety for our benefit. Such an accident happened in the spring of 1803, and occasioned the death of one person, and seriously wounded some others.

Count RUMFORD has clearly proved, that "though the individual particles of air can receive heat from other bodies, or communicate it to them, yet there is no communication of heat between one particle of air, and another particle of air. And hence it follows, that though air may, and certainly does carry off heat, and transport it from one place, or from one body, to another, yet a mass of air, with all its particles at rest, could it remain in that state, would be totally impervious to heat; or in other words such a mass of air would be a perfect non-conductor.

"Now if heat passes in a mass of air merely in consequence of the motion it occasions in that air, it is clear that whatever can obstruct and impede the internal motion of the air, must tend to diminish its conducting power. I found that a certain quantity of heat which was able to make its way through a wall, or rather a sheet of confined air half an inch thick, in 9$\frac{3}{5}$ minutes, required 21$\frac{2}{5}$ minutes to make its way through the same wall, when the internal motion of the air was impeded by mixing with it $\frac{1}{56}$ part of its bulk of eider down, of very fine fur, or of fine silk as spun by the worm."

Hence probably if a room were lined with canvas nailed on battens two or three inches thick, and the space filled up with rabbit fur, cotton, feathers or wool, very great advantages would be derived in respect to saving the heat. On the north-west and north-east sides of an exposed house, the experiment might at least be tried.

If fur be wanting, the same end may be nearly as well answered by the following plan. Place battens from one and a half, to two inches thick at proper distances against the wall, and the height of the room, and secure them by stay-nails driven in between the joints. Upon the battens lay the laths. The stay-nails may be of the following form.



Thus by confining a column of air between the wall and the laths, the air of the room is less affected by the diminution or increase of heat in the external atmosphere, and by the dampness which so commonly penetrates walls, to the injury of paper, pictures and furniture, is effectually prevented. It is a common practice to work blocks of wood into the walls, and to fasten battens to them for the purpose of lathing; but Mr. EVANS, (before mentioned) says that some walls thus treated, have been thrown several inches out of plumb, in consequence of the expansion of the blocks.

3 Cedar or cypress shingles are generally employed in the United States for covering houses: the danger arising from their combustible nature is obvious, and the effects of this combustibility have been frequently felt. Houses distant from a scene of conflagration have been often set on fire in consequence of sparks and burning flakes being carried to the roofs by the wind. New York indeed is an exception to the general passion for shingling. There tiles have been used for many years, and lately, from the fortunate discovery of a slate quarry in that state, this superior substitute is coming rapidly into use. The expense of a slate roof is but little more than a roof of shingles, and will last for ever, whereas a shingle roof must be repaired every twenty or thirty years.

4. *Stone Cornices* are of great utility in preventing the progress of fires. Where a row of houses is continued for some hundred feet, their utility must be particularly obvious in interrupting flames.

A battlement (parapet) and stone bracket in the cornice (if of wood) would also answer the same purpose. These were formerly in use in Philadelphia, but have been abandoned in later times.

5. Chimneys should uniformly be built in with the wall against which they are intended to run up; and when a chimney is carried up in a brick or stone house, not originally intended for a fireplace, it should be clamped with irons, and pinned on the outside of the wall; otherwise, in case of fire, the chimney will fall when the trimming joices on which it rests are burnt, and endanger the lives of those who may be meritoriously exerting themselves to save our property. Such an accident, and from the very neglect against which the reader is now cautioned, happened at a fire in Water-street, Philadelphia, where by the falling of a chimney, society and their families were deprived of some very valuable citizens.

6. The wind from the north-east in the United States being cold, and generally moist; and the north-west wind, though dry, being also cold, a house should be so contrived, if possible, as to occupy the above quarters with entries and stair-cases.

7. Count RUMFORD has taken notice of the benefits that are derived in cold countries from the use of double windows, (that is, one paned window near the outer surface, and another near the inner surface of the wall in each casement, with a vacant space between them) for a defence from the cold in high latitudes; and he wonders that it never should have occurred to any one, that double windows would be equally beneficial in keeping out the heat as well as cold; but to render this contrivance as beneficial for the purpose of cooling houses, we must add the following caution of Count RUMFORD. "When double windows are used in hot countries, to keep dwelling-houses cool, great care must be taken to screen those windows from the sun's direct rays, and even from the strong light of day; otherwise they will produce effects directly contrary to those intended. This may be easily done, either by Venitian blinds or by awnings. In all cases where rooms are to be kept cool in hot weather, the less light that is permitted to enter them, the cooler they will be."

8 The utility of stone stair-cases was mentioned under the article FIRE. See also STAIR-CASE.

9. In this climate, no house should be erected without a conductor of lightning. The preferable mode of securing a house from this awful agent, is described under the article CONDUCTOR.

10. Where shingles are used to cover roofs, the courses ought to be regulated by the following rules: When cedar shingles are used, they may be laid in courses of nine or ten inches; but when short cypress shingles are employed, the courses may be seven inches. In both cases they will be but three thick, which is a point to be aimed at. Such a roof will dry sooner than when thicker, and will not be so likely to leak as when thinner.

Some very old houses in Philadelphia, the roofs of which have not been renewed for many years, have their courses of shingles longer than more modern houses. Shingles are of late bevelled at their butt-ends, to permit an easy passage to rain, which by dropping from the abrupt thick end of the shingle, has been found to wear the roof; the bevelling however should be done before the shingles are taken up to the roof; for if afterwards done by a hatchet, the part intended to be pared will be missed by that instrument, which will penetrate the shingles already laid on, thus making numerous cavities for the reception of rain, and cause a rapid decay of the roof. An instance occurred in Philadelphia, of three adjoining houses, on one of which the shingles from being bevelled *on the roof*, leaked; while on the other two, they were put on as they came from the yard, and did not admit a particle of water. Shingles if dipped in fish oil, will have their durability greatly increased.

In South Carolina and Georgia, houses are built of a composition called *tabby*, which is ornamental, and very durable. It is made in the following manner.

Oysters shells (of which immense banks are found in those states,) are burnt to lime, and mortar made, into which are incorporated as many small dead shells as it will contain: this semi-fluid mass is then poured into frames of the size of the intended walls, and well pounded; when dry, the frame is raised, fresh tabby poured in, and again pounded: in this way the walls are built, and in a short time they become as hard as stone; and, being white, are particularly well calculated to reflect the intense rays of the sun.

MUD-HOUSES. "The way of building mud-houses, and walls for fencing in several parts of England, is as follows. They take any kind of soil of a loamy or clayey nature; but such as has been tempered in the bye-ways by cattle and horses is preferred: this is laid in a ring or circle, if there be sufficient room, and thereon a quantity of coarse hay or cut straw about four inches long, is laid, and upon that another coat of soil, and then oxen or horses (the former being preferred) are driven round over it as in threshing, and when sufficiently mixed by being thus trodden; and occasionally forked up, it is fit to begin the building with. A foundation of stone, about 12 inches above ground being first laid, a man takes a three pronged fork, whose prongs are flatted; and with it builds a wall of this tempered earth about 18 inches thick, and according as the weather is, sometimes two and sometimes three feet high, taking care to pack it as closely as possible. It is now left to become sufficiently dry to bear another layer of 2 or 3 feet high upon it. The operation is thus continued until the desired height is obtained. If it be a house of more than a single story, a curb frame of light scantling may be thrown round, and buried in the next layer, upon which also the ends of the beams may be laid.

When these walls are for fencing orchards, gardens, &c. the top is capped with a thatch of stubble, covered in the centre with a light layer of mud; and when for houses, the roofs are generally thatched with straw, and without any covering to the outsides of lime or plaister. These walls have been known to stand upwards of a century.

The advantage of building in this way, over the *pisé* building used in France, is peculiar to those countries where labour is high, because very little art is necessary; the commonest labourer being competent to the task; and there being very few situations that doth not admit of soils proper for the work; moreover it is not necessary to have the mud freed from small stones; whereas in the *pisé* buildings a considerable portion of art is practised in erecting the frames and in beating the work all over equally hard.

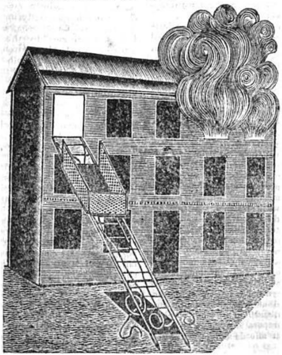
For small dwellings, stables, sheds, fences, ice-houses or other out offices, this is the cheapest and best mode that I know of; neither cold nor heat can penetrate these walls, and if plaistered on the outside, and painted or lime washed, they would appear as elegant as any common stone house, and very far superior to brick.

The advocates for *pisé* building complain, but without reason, of the use of straw or hay in the above described buildings, but the author of this article has known villages where almost every house was of this kind, and never remembered any inconvenience to arise from the supposed decay of that article: indeed the quantity is too small, and the soils when tempered properly and well packed on with the fork, will not admit of air, nor derive injury, from the partial and very imperceptible decay of the hay or straw therein."

For the above account of the mode of making mud-walls, we are indebted to S. W. JOHNSON, esquire, of New-Brunswick, New-Jersey.

We deem it proper to add here the following description of a FIRE-ESCAPE, which was drawn up for Dr. MEASE, by its inventor, Mr. B. DEARBORN, of Boston.

The contrivance of Mr. D. is certainly the best, that has ever come to our knowledge, and ought to be generally adopted. "It consists of a ladder, platform, and receiver; the ladder is made with two parrallel sides, each of which has two straight and plain surfaces; on the two outsides a groove runs from one end to the other; in these grooves two ledges slide, which being nailed to the bottom of the receiver, keep it from slipping off; the bottom of the receiver is made of boards, somewhat longer than the breadth of the ladder, which are confined together by the ledges; the two sides, and one end of the receiver, are guarded with an iron frame and net-work: the receiver is drawn up the ladder by two ropes, which pass over pullies near the top of the ladder; the pullies are fixed in separate pieces, which are nailed on the inner surface of each side of the ladder, a little below its upper edge, so that the ropes may pass between the steps of the ladder and the bottom of the receiver; the ropes are made fast under the bottom of the receiver; then passing upward *over* the steps of the ladder, they go over the pullies, and their ends go down *under* the steps of the ladder to the platform; the platform is made of boards, nailed to two long hinges, by which it is attached to the ladder near the bottom; the extremity of each hinge is made sharp, and is turned downward, to enter the ground and assist in keeping the ladder steady; the feet of the ladder are also guarded with iron points. The men who draw up and let down the receiver, stand on the platform, whereby they have a clear stage for themselves and the ropes, and their weight keeps the ladder firm. When the receiver is heavily loaded, it will be necessary to pass the ropes under one of the steps of the ladder, that their friction may increase the power of sustaining the weight. When the ladder is to be removed, the platform is to be turned up and buttoned to the under side, and the receiver is to be made fast, a little above the foot of the ladder, by a pin passing through both; then the ropes can be used in taking down the ladder, and in raising it again when necessary, which it may be best to do thus: let the ladder be laid bottom upward on the ground, the receiver being underneath, and the ropes uppermost; then the weight of one or more persons on the foot of the ladder, will assist in raising it to a greater or less angle, as the receiver may be nearer or further off from its extremity; then with the assistance of the ropes, it may be raised perpendicular, and directed to its situation." The annexed cut will convey a full idea of the machine.



HOUSE-LEEK, or *Sempervivum*, L. a genus of perennial plants, consisting of 13 species, one of which, the *Sempervivum tectorum*, Common House-leek, or Cyphel, is a native of Britain; it grows on the roofs of houses and old walls, where it flowers in the month of July.

This plant is eaten by sheep and goats: its juice, when mixed with honey, is said to be of considerable service in aphthous cases, or the thrush of children; it also affords immediate relief, whether applied by itself or mixed with cream, in burns and other external inflammations.

HOVEN, or *blown Cattle*. See art. CATTLE.

HUNGER, an uneasy sensation, occasioned by long abstinence from food, when the body is in a state of perfect health.

[Persons liable to be exposed to great hunger, should carry with them, portable soup well seasoned; parched Indian corn ground and mixed with one-tenth of sugar; and some fat pickled pork to be eaten sparingly. The *painful* sensation of hunger, is allayed by opium.—T. C.]

[Two ounces of fat pork, two ounces of portable soup, and four ounces of parched corn, will suffice for twenty-four hours.—T. C.]

In attempting the restoration of those unfortunate persons who have endured the horrors of famine, we recommend the utmost precaution. Warmth, cordials, and the most nourishing broths, or jellies, are to be administered gradually, and with great circumspection; for otherwise, even these might prove fatal. The most judicious mode of communicating warmth to the exhausted patient, will be to place a healthy person on each side in contact with him. Bathing the feet in warm water, and fomentations, may be advantageously employed; but their temperature ought to be lower than that of the human body, and imperceptibly increased. New milk, weak broth, or water-gruel, may be used for both purposes, as well as in repeated clysters; because nourishment may, in this manner be effectually conveyed into the body by different passages, which are most pervious during a state of long abstinence; provided the means of relief have not been too long delayed. Cordials should at first be given in very small doses, and much diluted: one of the best preparations is white wine-whey, which affords both a gentle stimulus and easy nutriment. When the patient's stomach acquires a little strength, a new-laid egg may be mixed with the whey, or given in some other form that may be more agreeable to his palate. Thus, he may progressively return to a more substantial diet; so that, by proper care and cheerful society, he will in a short time be restored to health.

HUNTING, the exercise, or diversion of pursuing wild quadrupeds, whether those of game or prey.

Hunting has at all times been a favourite amusement, as well among the rudest, as the most polished nations. Much, however, has been said both for and against the continuance of this practice. The late FREDERIC the Great, of Prussia, never joined in the chase. Where wild, or noxious animals abound, or where the object of hunting is to procure the necessary supply of food, the chase is doubtless justifiable. But, when it is attended with such mischief as is often the case in highly cultivated districts, we conceive it ought to be gradually abolished.

HURRICANE, a violent storm, such as is often experienced in the western hemisphere. Hurricanes are frequent in the West-Indies, where they make terrible ravages, by rooting up trees, destroying houses and shipping, and the like. The natives, it is said, can foretel hurricanes by the following prognostics: 1. All hurricanes happen either on the day of the full, change, or quarter of the moon. 2. From the unusual redness of the sun, the great stillness, and at the same time, turbulence of the skies, swelling of the sea, and the like, happening at the change of the moon, they conclude there will be a hurricane next full moon; and if the same signs be observed on the full moon, they may expect one next new moon. As to the cause of hurricanes, they undoubtedly arise from the violent struggle of two opposite winds. Now as the wind between the tropics is generally easterly, and upon the sun's going back from the northern tropic the western winds pour down with violence upon those parts, the opposition of these contrary winds cannot fail to produce a hurricane. Hurricanes shift not through all the points of the compass, but begin always with a north wind, veer to the east and then cease; and their shifting between these two points is so sudden and violent, that it is impossible for any ship to veer with it: whence it happens that the sails are carried away, yards and all, and sometimes the masts themselves writhed round like an osier.

HUSBANDRY, the business of cultivating the earth, and rearing animals. Husbandry is the proper term for that which is commonly called farming; and, accordingly, in law, a man of this profession is not to be styled a farmer, but a husbandman. The word farmer has a more general sense. Husbandry includes agriculture, breeding, grazing, dairying, and every other occupation by which riches may be drawn from the superficial products of the earth. Husbandry may also be considered as the science, of which agriculture and the rest are the parts of practice. It was, perhaps, the author of Telemachus that first retrieved, in the eyes of Europe, that reputation for importance to which husbandry has so just a claim. From his age, it has been progressively rising in estimation; and the present beholds, not only the children of feodal chieftains seeking honourable renown in that pursuit which was once abandoned to the meanest of their fathers' vassals, but, with a spirit that, to the disgrace of later times, must be called antique, the state and the plough guided by the same hands.

While the patriotism, however, of the great is thus laudably directed, there are not wanting those who call in question the utility of their exertions, and even attribute to them a diminution of the quantity, or, what is tantamount, an increase of the cost, of the products of the earth.

The question lies in a small compass: it includes only one point, namely, whether these exertions *have* diminished the quantity of the products of the earth? for, if they have not done this, the rest must be the work of other causes.

Now, will any man say, that a given number of acres in tilth, yields less grain under the new husbandry than under the old, or, in pasture, feeds fewer animals? The reverse is certainly true; and if the several products are greater than they were before, or even equal, it will necessarily follow, that the increase of cost must result from circumstances wholly unconnected with the improvements, or the experiments, in husbandry.

The circumstances, probably, from which the rise in the value of provisions proceeds, and which the exertions in question actually *tend* to counteract, are these: the growth of population; the growth of commerce; and the growth of wealth, and consequent falling off of the relative worth of money.

If we will pursue commerce, we must not be such children as to suppose, that this, of all human concerns, can be without its evils. Instead of saying, that the improvements raise the price of provision, we ought to inquire how far such well-aimed, though inadequate, efforts, have, on the contrary, moderated that rise? The fair question is, what *would* have been the prices, other things the same, had not these improvements taken place?

What are the objects of improvements in agriculture? The lessening the quantity of labour, by means of implements, machines, and methodical arrangements; and the ascertaining the principles of vegetation, and of the operation of manures. Now, can it be supposed that the reduction of expense in wages, and the cultivation of plants, and use of manures, less at random than formerly, have any tendency to multiply the price of the products?

What are the objects of improvements in breeding? The rearing such animals as, from their conformation, contain the greatest proportion of meat within a given weight of carcass; and such as, from the economy of their organs, will acquire the greatest quantity of flesh within a given time, and from a given quantity of pasture. Now, it is a fact, that by resorting to the improved breeds, instead of the common, a greater weight of meat may be obtained from a smaller consumption of grass; and need any other be cited, to justify a preference, and prove that that preference tends to enlarge the supply, and, of consequence, to reduce the price of the market? A mistake seems to be prevalent, with respect to the utility of raising such animals as the emulation excited by prizes has brought forward. The truth is, it is not intended that the markets should be filled with only such as these; but, if, in a given time, and upon fixed principles, such can be produced, then, upon the same principles, and in proportionate spaces of time, other animals, not so large, but equally profitable, may also be produced. In a word, the whole subject of controversy might be said to be, whether in agriculture, it is better to have principles of conduct, or to proceed at hazard.

Improvements always meet with opposition from those who are attached to former methods; and it is desirable that, by this struggle, they should be separated from innovations: so far, the argument is rational; but when it is taken upon foreign grounds, when that which is merely a matter for examination among professional men, or those who make husbandry their study, is dragged into public disputation, and made to account for the concerns of trade, it ought to be considered as wholly nugatory. The only hypothesis upon which the new husbandry can be implicated in the rise of the markets, has been stated; and if this is not supportable, it will probably suggest itself to the mind of the reader, that the appearance of the several occurrences at the same time, is the only reason that a relationship is imputed.

"New Husbandry" is chiefly distinguished from the "old," 1. by the use of new implements; 2. by drilling corn and seeds, instead of sowing in the broadcast manner, that is, scattering them with the hand; 3. by substituting a rotation of crops to the use of fallows; 4. by the use of lime and marl as manures; and, 5. by rearing a larger number of animals, by means of which, a farm is made to produce, in a great degree, its own manure. JETHRO TULL was the father of the new husbandry.

HYACINTH, *Hyacinthus*, L. a genus of perennial plants, comprising 16 species, one of which is indigenous; namely, the *nonscriptus*, English Hyacinth, or Harebell Hyacinth, (*Scilla nutans*, or Wild Hyacinth of Dr. SMITH:) it grows in woods and hedges, where it flowers in the month of May. The fresh roots of this plant are poisonous; but it appears from experiments, that they may be advantageously converted into *starch*.

The most admired of the exotic species is the *Orientalis*, or Eastern Hyacinth, which is cultivated to a great extent, and with success, by the florists of Holland, whence it has been lately imported. It is one of the most odoriferous flowers, and has several hundred varieties.

The hyacinth is a hardy plant, and will prosper in any soil, though the more delicate varieties require to be sheltered during the severity of winter. They may be propagated either from the seed, or by planting off sets from the roots, in autumn; in which latter case the bulbs ought to be previously cleaned and dried.

HYDATIDS, a singular tribe of animals of the genus tænia, belonging to the class and order of intestinal worms. They derive their name from the circumstance of their being formed like a bladder, and distended with an aqueous fluid. They have been traced in mammalia, serpents and fishes, but chiefly in the first of these classes, and more particularly in the liver of man, and in the liver and brains of sheep, than in any other animal tribe or organs. Dr. BAILLIE says they are found in the kidneys as well as the liver of man. They are said to enclose each other like nests of pill-boxes in the liver.

HYDRA, the polype, a genus of the class vermes, and order zoophyta: the animal fixes itself by the base, is linear, gelatinous, naked and contractile. It inhabits fresh waters. There are five species, three of which are found in Great Britain: of these, the principal is Hydra viridis, having about ten tentacles shorter than the body. It inhabits stagnant waters, and is found on the surface of plants, and appears at first sight like a little transparent green jelly. This is the appearance in the quiescent state, but when expanded, it is a linear body, fixed at one end, and surrounded at the other by tentacles or arms placed in a circle round the mouth, and generally producing its young from the sides. These, at first, seem small papillæ, increasing in length, till they assume the form of the parent, and then dropping off. The whole tribe has a most wonderful faculty of re-producing parts which have been destroyed, and if cut or divided in any direction, each separate part becomes a perfect polype, as slips of certain plants become the same plants in perfect form.

HYDRARGYRUM, a name given to quicksilver, or mercury, on account of its liquid state. See MERCURY.

HYDRASTIS CANADENSIS, CANADIAN yellow dye.

The root is composed of thick fleshy tubers, of a deep yellow colour within, but covered by a brown skin The fruit is red and succulent; it delights in shade and moisture; flowers in May and June. The Indians dye a fine yellow colour with the root.

HYDRAULICS, that branch of hydrostatics which teaches to estimate the velocity of moving unelastic fluids. It is this important science, that furnishes the principles upon which the engines are constructed, by which water is raised. Without it, water could not be led into those dwellings, the bases of which are above the surface of rivers; nor could any be supplied to extinguish accidental fires. To these, are to be added, pumps, steam-engines, fountains, and a variety of useful contrivances, all, more or less, dependent on hydraulics.

The foundation of hydraulics, is that principle of fluids, which distinguishes them so remarkably from solid bodies, and which is, that, if led in pipes, they will always rise to the level, or nearly so, of the reservoir whence they are supplied. This, in works simply hydraulic, is all; but in those both hydraulic and pneumatic, the force of air is added, to increase the natural velocity of water, and raise it to extraordinary heights.

Machines, of both these descriptions, are in such daily and ordinary use, that their nature, and consequently the general outlines of hydraulics, will be easily explained. The first comprehend those by which water is brought into the upper stories even of houses, and by which artificial fountains are made to rise. Here, nothing more is necessary than to have a reservoir, the surface of which is somewhat above the level to which the stream is desired to ascend. The surface of the reservoir is to be somewhat above that level, because of the resistance of the air at the opening, for which it is necessary to allow a small deduction.

When jets are executed in the best manner, the resistance of the air only will cause them to fall short of the height of their reservoirs, in the following proportions:

Jet.	Reser.	
Feet.	Feet.	Inches.
5	5	1
10	10	4
15	15	9
25	27	1
35	39	1
45	51	9
55	65	1
65	79	1
75	93	9
85	109	1
95	125	1
100	133	4

From these facts, it is determined, that as often as a five-foot jet shall be contained in the height of any jet proposed, by so many inches, multiplied into themselves, or squared, the surface of the water in the reservoir which supplies it, ought to exceed that jet in height.

If, however, there be not a natural reservoir of the necessary height, such a one must be formed, and the water raised into it, artificially, and here it is that engines, both hydraulic and pneumatic, are required, so that, by the assistance of air, the water may be forced upward. Thus the water which, from the Thames, and the New-river, supplies the inhabitants of London, is first raised into reservoirs, the surfaces of which exceed the extreme height of the pipes they supply; and, this being done, the rest follows upon the simple principles already described. The common pump and water engines are both hydraulic and pneumatic.

The steam engine is a compound piece of machinery, frequently applied to hydraulic purposes, but not absolutely in itself hydraulic. Its action is produced by the power of vapour, or steam, rising from boiling water; in the same manner that the action of a smoke-jack is produced by that of vapour, or smoke, rising from coals. The power of vapour is immense; one hundred and forty pounds of gunpowder will blow up a weight of thirty thousand pounds; but the same weight of water, converted into vapour, will lift up a weight of upward of seventy-seven thousand pounds.

The steam-engine is employed to work various kinds of machinery, in all of which, the specific operation it performs, is that of lifting. See Pump, Steam-engine, &c.

HYDROCEPHALUS. See Water *in the head.*

HYDROGEN. Hydrogen is one of the constituents of water; fifteen parts of hydrogen, and eighty-five of oxygen form this fluid. It is never found but in a state of combination. It approaches nearest to purity when combined with caloric, and in the form of gas. Whatever process decomposes water, will produce hydrogen gas, provided the oxygen of the water be absorbed by any other substance, as is seen in the following experiments. If water be dropped gradually through a gun barrel, or iron pipe, made red hot in the middle, the water will be decomposed; the oxygen will form an oxyde or rust with the iron, and the hydrogen gas will come out pure from the opposite end.

Plunge a red-hot iron into water, the hydrogen gas rises with the vapour, and is known by its peculiar smell. Hydrogen gas is twelve times lighter than common air, hence it has been applied to the filling of balloons. It is highly inflammable under certain circumstances, hence it was formerly known by the name of *inflammable air*. It is incapable of supporting flame or combustion of itself. It burns only in consequence of its strong attraction for oxygen.

Hydrogen also forms one of the constituents of coal, from which it may be extracted in the form of gas. Hence it has been used for lighting up streets and houses by what is called gas lights.

Ex. 1. To procure hydrogen gas, provide a phial with a cork stopper, through which is thrust a piece of tobacco pipe. Into the phial put a few pieces of zinc, or small iron nails: on this pour a mixture of equal parts of sulphuric acid, (oil of vitriol) and water previously slowly mixed in a tea-cup to prevent accidents. Replace the cork-stopper with the piece of tobacco pipe in it. The hydrogen gas will then be liberated through the pipe in a small stream. Apply the flame of a candle or taper to this stream, and it will immediately take fire and burn with a clear flame until all the hydrogen in the phial be exhausted. In this experiment, the zinc or iron, by the action of the acid becomes oxygenised and is dissolved, thus taking the oxygen from the sulphuric acid and water. The hydrogen, the other constituent part of the water, is thus liberated and ascends.

2. Apply a bladder (previously wetted and compressed in order to squeeze out all the common air) to the piece of tobacco pipe inserted in the cork stopper of the phial. The bladder will thus be filled with hydrogen gas.

3. Adapt the end of a common tobacco pipe to the bladder thus filled with hydrogen gas, and dip the bowl of the pipe into soapsuds, prepared as if for blowing up soap bubbles. Squeeze out small portions of gas from the bladder into these soapsuds, and the bubbles formed will ascend into the air with very great rapidity, until they are out of sight.

4. If a lighted taper or candle is applied to the bubbles as they ascend from the bowl of a tobacco pipe, they will explode or burst with a loud noise. By the application of the flame of the candle in this experiment, the hydrogen in the soap bubble is burnt or decomposed, and forms water by uniting with the oxygen of the atmosphere. The noise made by the explosion, is occasioned by the atmospheric air suddenly rushing in, or collapsing upon the empty space left by the bursting or exploding of the gas bubble.

5. In order to produce an imitation of the gas lights, pound a small quantity of coal into a powder, and put it into the bowl of a tobacco pipe. Cover the coal closely over with clay, and put the bowl of the pipe into the fire. In a few minutes a stream of hydrogen gas will issue from the end of the tobacco pipe, which may be set fire to with a candle or piece of lighted paper, in the usual way.

1. In this experiment the volatile parts of the coal are rarefied and driven off through the tobacco pipe; and hydrogen being one of the constituent parts of coal, passes off in the gaseous form. In this state it holds in solution some of the substance called carbon. Hence it has been sometimes called carburetted hydrogen gas.

2. In the production of gas lights on a larger scale, the coal is put into an iron cauldron, and heat applied to it, when the gas ascends, and is distributed by means of metal pipes into the various apartments of a house, or through the streets of a town.

In experiments upon the combustion of hydrogen gas, a dangerous explosion takes place if care be not taken to keep the gas entirely free from any mixture of common air.

Ex. Into a bladder half full of atmospheric air, introduce hydrogen gas in the way already described, until the bladder is full. With this mixture of gas and atmospheric air, fill a wide-mouthed phial. On applying flame to the mouth of the phial, the contents will explode with a loud report, and break the phial if it be not very strong, or guarded by a cloth wrapped round it. Some employ a copper phial in this experiment.

Hydrogen gas, besides being combined with water, may also be combined with sulphur, phosphorus, and carbon. It is then called sulphuretted hydrogen, phosphuretted hydrogen, and carburetted hydrogen. Sulphuretted hydrogen gas forms part of the fetid effluvia which rises from house-drains, and is produced by the decomposition of animal and vegetable substances, containing sulphur and hydrogen. Phosphuretted hydrogen gas has a fetid putrid smell, and takes fire whenever it comes in contact with the atmospheric air.

Ex. 1. To procure phosphuretted hydrogen gas, put a small quantity of phosphorus, and some potass dissolved in water, into a retort. Apply the flame of a candle or lamp to the bottom of the retort, until the contents boil. The phosphuretted hydrogen gas will then rise and may be collected in receivers.—2. Instead of receiving the gas into a jar, let it simply ascend into the water of the tub. The bubbles of gas will then explode in succession as they reach the surface of the water, and a beautiful cloud of white smoke will be formed, which rises slowly and majestically to the ceiling.

3. If bits of phosphorus are kept some hours in hydrogen gas, *phosphurised hydrogen gas* is produced, which has the smell of garlic. If bubbles of this gas are thrown up into a receiver, previously filled with oxygen gas, a brilliant bluish flame will immediately fill the jar. It is this gas which is seen on the surface of burial grounds and swamps at night, and is known by the name of will-o'-the-wisp. This gas is also emitted from fish, which gives them a shining appearance in the dark.

Carburetted hydrogen gas is that which is produced from the distillation of coal, and is used for gas lights.

HYDROGRAPHY, in cosmography, the description of the *water*, or ocean, seas, rivers, &c. as *geography* is the description of the *earth*, or land.

HYDROMETER, an useful instrument for measuring the gravity, density, strength, &c. of spirits, or other liquids.

[Several contrivances of this kind have been and are used. The most simple is the following. Procure a phial with a neck rather long and narrow, that will hold 1000 grains of distilled water at the temperature of 60° of Fahrenheit's scale. Mark with a fine file, the place to which 1000 grains of such water reaches up the neck of the phial. Have ready a weight which shall exactly counter balance the phial with 1000 grains of water in it. Suppose you want to ascertain the specific gravity of spirits, (alcohol):—Fill the phial up to the water mark; then, by so many grains as is necessary to make the phial, thus filled, equal to the standard weight in the other scale—such is the strength of the spirits. Suppose you want to weigh oil of vitriol; fill the phial to the water mark: add weights to the standard to make the scales balance: the weights added are the exponents of the strength of the oil of vitriol.—T. C.]

HYDROPHANE, or *Oculus Mundi*, is a kind of opal, the distinguishing characteristic of which is that it gradually becomes transparent by immersion in water. It is either of a whitish brown, yellowish green, milky grey, or yellow colour, and opaque. The name of oculus mundi has been given to these stones from an internal spark, or luminous spot, which changes its position according to the direction in which they are held to the light. The countries in which they are chiefly found are Hungary and Iceland.

They are sometimes set in rings, and the prices at which they were formerly valued were in the highest degree unaccountable and absurd. At present their value is considerably lower, though they are still in great request as objects of curiosity. The phenomenon of their becoming transparent in water is supposed to be occasioned by that fluid soaking through their whole substance, in the same manner as the transparency of paper is occasioned by immersing it in oil. An hydrophane weighing 27½ grains was kept four minutes in water, and on being taken out weighed 32½ grains, having received in this short period an augmentation of five grains, or more than one-sixth part of its whole weight. When taken out of the water, these stones as they dry become again opaque.

HYDROPHOBIA. See Bite *of a Mad Dog*.

It is a prevailing opinion in Ireland and Great Britain, that what is called *worming a dog*, prevents the possibility of his communicating that most dreadful of all calamities, *Hydrophobia*. We have recently learned that this opinion is so general in Germany, at least in Saxony, that the government appoints in every district an officer, whose duty it is to worm every dog in his district, and to fine all those who shall neglect to call upon him to perform his duty while the dog is yet a puppy.

Quere. Is not this opinion general enough to warrant an investigation? If it be well founded it would probably lead to the most important regulations and consequences.

HYDROSCOPE, an instrument anciently used for the mensuration of time. The hydroscope was a kind of water-clock, consisting of a cylindrical tube, conical at the bottom. the cylinder was graduated, or marked with divisions; and as the surface of the water, which trickled out at the point of the cone, successively sunk to these several divisions, it pointed out the hour.

HYDROSTATICS, the science which treats of the weight, of the nature and properties of fluids; and which teaches the arts of assaying metals, of ascertaining the strength of spiritous liquors, of determining the specific gravities of bodies in general, the principles upon which water may be raised, and all hydraulic engines constructed. This science treats more especially of the mechanical properties of non-elastic fluids, particularly of water. Fluids are subject to the same laws of gravity with solids, but the want of cohesion of their parts occasions some peculiarities. The parts of a solid are so connected as to form a whole, and their effort is concentrated into a single point called the centre of gravity, but the several parts of a fluid gravitate independently of each other, and hence it is that the surface of a fluid contained in an open vessel is always level. Fluids have this remarkable property, that they press not only in common with solids perpendicularly, but also upwards, sideways, and in every direction equally.

Ex. 1. Take a glass tube open at both ends, put a cork in one end, and immerse the other in water. The fluid will not rise far in the tube, but the moment the cork is taken out it will rise to a level with the surrounding water.

2. If a vessel consists of pipes variously inclined, communicating with each other at the bottom, and open at the top, water poured into any one of them will rise to the same level in all.

The pressure of the same fluid is in proportion to the perpendicular height, and is exerted in every direction, so that all the parts, at the same depth, press each other with equal force in every direction.

3. An empty bottle being corked, and by means of a weight, let down a certain depth into the sea, it will be broken, or the cork will be driven into it by the perpendicular pressure. But a bottle filled with water, wine, &c. may be let down to any depth without damage, because in this case the internal pressure is equal to the external. The horizontal bottom of a vessel sustains the pressure of a column of the fluid, the base of which is the bottom of the vessel, and the perpendicular height is equal to the depth of the fluid.

4. The pressure of a fluid upon any given part of the bottom or sides of a vessel is equal to the weight of a column of that fluid, having a base equal to that part of the bottom or side, and an altitude equal to the perpendicular height of the fluid above it. Hence may be calculated the pressure upon, and the strength required for dams, cisterns, pipes, &c. And thus we are led to what is called the hydrostatical paradox, which is of vast importance in this science: viz. That any quantity of fluid, however small, may be made to balance any other quantity, however large.

The upper pressure of fluids is shewn by the hydrostatical bellows, which consists of two circular or oval boards, covered with leather, to rise and fall like common bellows, but without valves. A pipe about 3 or 4 feet long is fixed to the under board. If a little water run into the bellows to separate the boards, then weights to the amount of two or three hundred pounds may be put on the upper board; after which, if the pipe be supplied with water, it will by the upper pressure raise the weights and sustain them.

The hydrostatic balance, used for finding the specific gravities of bodies, differs but little from the common balance, only it has a hook at the bottom of one of the scales, on which different substances that are to be examined may be hung by horse-hairs, so as to be immersed in a vessel of water without wetting the scale. If, for instance, a body suspended under the scale be first counterpoised in air by weights in the opposite scale, and then immersed in water, the equilibrium will be destroyed; then if a weight be put into the scale from which the body hangs to restore the equilibrium, that weight will be equal to the weight of a portion of water as large as the immersed body. If this body represents a guinea, then in air it weighs 129 grains, and by being immersed in water it loses 7¼ grains, which shews that a quantity of water equal, in bulk, to a guinea, weighs 7¼ grains, therefore according to the rule, given in the article GRAVITY *specific*, divide 129 by 7¼, or 516 by 29, and the quotient will be 17.793, which proves that the guinea is 17.793, or almost 18 times heavier than its bulk of water.

HYGROMETER, an instrument for measuring the moisture of the atmosphere, as the *barometer* measures the weight. The plan upon which such an instrument is to be constructed, must be that of taking for a standard some substance which swells when the atmosphere is moist, and shrinks when it is dry. The *degrees* of this swelling or shrinking, will determine the degrees of moisture or dryness. The hygrometer has not yet been brought to the desired perfection. It has been constructed upon three principles: 1. The lengthening and shortening of strings, or their twisting and untwisting, by reason of moisture and dryness; 2. The swelling and shrinking of solid substances, from the same causes; and, 3. The increase or decrease of the weight of particular bodies, whose nature it is to absorb the humidity of the atmosphere.

HYGROSCOPE, the same with hygrometer. In all names of instruments to which there are these two several terminations, as *thermometer* and *thermoscope*, the only difference is, that the first expresses something which *measures*, and the latter, which *shows*, or *exhibits to view*.

HYPERICUM, *Saint John's Wort.* A genus of plants including a great many species. Professor MARTYN, in his late edition of MILLER'S *Gardener's Dictionary*, enumerates 7 species, natives of the United States. It is to be sincerely regretted that this destructive plant is found on any part of our soil. Probably the farmer has not a greater enemy to contend with, the wheat fly excepted. Mr. PETERS says he "knows none in the pestiferous catalogue so exhausting and destructive as the St. John's wort. Besides being injurious to cattle and other stock, it is the greatest enemy the clover husbandry has to contend with. It grows from roots, slips and seed, and so difficult is it to eradicate, that though two well attended crops of Indian corn (zea mayz) may conquer the old stock of this weed, a new growth will spring up from the seeds which had dropped and remained in the earth." Mr. P. destroyed this new growth by turning up the roots, by shallow ploughing to the frost of a severe winter. Those who have not been visited by this scourge, should be watchful to eradicate it at any expense or labour, on its first approaches. A small degree of expense and attention will then *prevent*, what it is extremely difficult to *remedy*, when it has gained full possession of their fields.

HYPOCHONDRIAC AFFECTION, or *Hypochondriasis*, may be defined to consist in a corrupted state of the stomach and intestines, accompanied with languor, dejection of mind, and fear arising from insufficient reasons, in persons of a melancholy disposition.

Among the numerous causes contributing to generate this tormenting affection, the most frequent are, disorders of the liver and suppressions of the customary evacuations. To these may be added, an hereditary disposition; too free indulgence in wine; repelled eruptions; violent passions of the mind, &c.

The cure or removal of hypochondriasis must be attempted by those medicines which are calculated to counteract occasional causes, and obviate the more urgent symptoms: hence gentle laxatives, acidulated and chalybeate waters, as also copious draughts of cold water, have often been productive of the best effects. Emollients, diluents, the cold bath, Peruvian bark, and exercise, especially riding on horseback, if judiciously resorted to, have all been found of service.

Hypochondriac patients ought never to fast long; their diet should be solid and nourishing, they ought carefully to avoid all acescent and flatulent vegetables. One of their principal objects, however, ought to be that of preserving the mind constantly in a cheerful and serene state. Nor should they neglect to rub, if possible, the whole body, every morning and evening, for ten minutes, or longer, with coarse flannel cloths. Where the patient's circumstances can support the expense, a voyage to a warmer climate will be of greater advantage than medicines; though a rigorous adherence to a proper diet and regimen, at home, may also restore his health, and more certainly than luxury and dissipation abroad.

HYRAX, a genus of Mammalia of the order Glires, of which there are only two species, viz. the hyrax Capensis, or Cape-hyrax, and the hyrax Syriacus, or bristly hyrax, to be met with in Ethiopia and Abyssinia, particularly under the rocks of the mountains of the sun. The animals of this genus are gregarious, and may be seen in companies of several scores together before the clefts of the rocks, basking in the open sunshine. They live on grain, fruits, and roots, and when kept in confinement will live upon bread and milk.

HYSSOP, or *Hyssopus*, L. a genus of exotic plants, comprising three species, the principal of which is the *officinalis*, or Common Hyssop. It grows to the height of 18 inches; is a very hardy plant, and may be propagated either by slips or cuttings, or by seeds. The leaves have an aromatic smell, and a warm pungent taste: they are particularly recommended in humoural asthmas, coughs, and other disorders of the breast and lungs; being supposed powerfully to promote expectoration.

HYSTERICS, a spasmodic or convulsive disease, to which females chiefly are subject. It attacks them at uncertain intervals, and is usually preceded by a languor and debility of the whole frame. There is a violent pain in the head; the eyes become dim, and shed involuntary tears; a sensation is felt similar to that of a globe rising from the lower part of the abdomen to the stomach; and, at length, it reaches the throat, where it produces a sense of suffocation, a difficulty both of breathing and swallowing, while it is accompanied with great pains in the lower belly.

The general cause of hysterics is supposed to consist in too great a degree of mobility and irritability of the nervous system: whatever tends to enervate the body, may induce this complaint. Such are excessive heat, cold, terror, fear, grief, rage, acrid humours, ill smells, scorbutic affections, and glandular obstructions. Hence it chiefly attacks females of weak, relaxed habits; though a few instances have occurred, in which men have also been affected.

Notwithstanding the very alarming nature of this disorder, it seldom terminates fatally, unless from erroneous treatment. It, however, admits only of palliation, as it has but in few instances been completely removed. The chief object is to counteract or prevent the peculiar convulsive affection which immediately precedes the attack. And though we are in possession of a remedy, sufficiently powerful to effect that desirable purpose, yet great circumspection is required in its use; as, otherwise, the consequences might be more distressing than the disease. This medicine is *laudanum*; which, judiciously administered, checks the most violent paroxysms for a considerable time, but cannot accomplish a cure. Relief has also been obtained by the sudden affusion of cold water on the face and hands, but more frequently from the application of warm water, especially to the feet and legs. In order to effect a radical cure, it will be requisite to resort to chalybeates, mineral waters, or other tonics, and especially to the cold bath, where the constitution can support it. The diet of hysteric patients ought to be light and nourishing; they should carefully avoid whatever tends to relax the bowels or debilitate the system. Gentle exercise, and cheerful society, ought by no means to be neglected. Thus, by proper attention, this painful malady may possible in the course of time be removed; or at least so far palliated, that its attacks will be less frequent and violent.

[Hysterics, are *mostly* owing to indigestion. A glass of hot water with ginger and a table spoonful of brandy, almost always gives temporary relief. In violent cases add about 25 drops of laudanum.—T. C.]

HYSTRIX, the porcupine, a genus of animals of the class Mammalia; and of the order Glires. There are five species, of which the Hystrix cristata or common porcupine may be noticed. It is found in Africa, India, and the warm climates of Europe. The upper part of its body is covered with variegated spines or quills, which are long and sharp, and which, when the animal is irritated, it has the power of darting out against an adversary. Its principal food consists of the bark of trees, roots and various kinds of fruit, which it collects in the night. In the day it lies retired, sleeping in a subterraneous habitation, which it is said to construct with particular ingenuity, dividing it into several apartments.

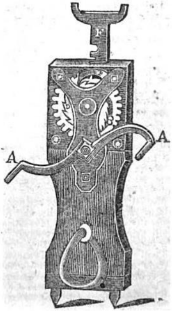
I. J.

I is the ninth letter in the alphabet, and the third vowel. Its sound varies; in some words it is long, as *high, mind:* in some it is short, as *bid. kid,* and in others it is pronounced like *y,* as *collier, onion,* &c.; in a few words its sound approaches to the double *e e,* as in *machine.* I, used as a numeral, signifies no more than one, and it stands for as many units as it is repeated times, thus II, III, stands for 2 and 3. When put before a higher numeral it subtracts itself, as IV, four, and when set after it, the effect is addition, XII, twelve.

J is the tenth letter in the alphabet, and has always a soft sound in English, like that of the soft *g,* as *judge, jet, jack.*

JACK, a well-known machine for raising timber, or other ponderous bodies.

Although numerous accidents almost daily happen in using the common jacks, for want of a contrivance to prevent the machine from taking a retrograde course, if the weight should, from any circumstance, overbalance the power, no attempts have till lately been made, to protect the workmen on such occasions. In order, therefore, to supply this deficiency in mechanics, as far as our opportunities will admit, we offer the annexed cut to the consideration of those readers who are not yet acquainted with the improvement it represents.



This machine was, in the year 1794, presented to the Society for the Encouragement of Arts, &c. by Mr. Mocock, of Southwark (Eng.) for which he was rewarded with a premium of 20 guineas.

Description of the Cut of Mr. Mocock's *Improved Machine for raising large weights.*

A A; are the double handles of the winch.

B, represents the large toothed wheel, in which the pinion on the axis C, works.

D, a ratchet-wheel.

E, the clink, or pall, which falls into the teeth of the ratchet, and thus prevents the machine from running back, in case the weight should at any time overcome the power.

F, the rack, as appears in jacks of the common construction.

From a comparison of Mr. Mocock's jack with those in common use, the former differs from the latter only in one respect; namely, that, in the improved machine, a pall, or chick, and ratchet, are applied in such a manner as to stop the machine in the case above mentioned, and thus to prevent those melancholy accidents which frequently occur, especially on board of ships engaged in action; when, from inattention, or neglect in fixing the hooks, or from any other cause, the common jacks fail: and, as the difference in its mechanism is not material, the improvement may be easily applied to the instruments already manufactured.

Jack-by-the-hedge. See Garlic Hedge Mustard.

JACK-DAW, or *Corvus monedula*, L. a notorious bird, that is a native of Great Britain. It breeds in steeples, old castles, and on lofty rocks, where the females deposit five or six eggs.

The jack-daw is a gregarious bird, feeding on insects, seeds, and grain. It is equally mischievous in the fields as well as in the gardens, and is so prone to stealing, that it carries away more than is necessary for its subsistence. Hence various methods have been contrived for taking this depredator: one of the most effectual is that practised in some parts of England, and which is so ingenious, that it deserves to be more generally known.

A stake, about five feet long, is first driven firmly into the ground; the upper point is previously made so sharp that no bird can possibly settle on it. Within a foot of the top is bored a hole, three quarters of an inch in diameter, through which a stick is put, about eight inches in length. A horse-hair noose is next fixed to a thin wand made of hazel, which is passed through the hole: the remainder being left open beneath the transverse stick. The other end of the hazel rod is then introduced into another hole in the stake near the ground, where it is fastened. The stake should now be placed in a situation which is frequented by the bird in quest of food, when he will consequently be induced to alight on it; but on finding the point too sharp, he will probably settle on the little transverse stick: as this sinks with his weight, his leg will be effectually secured in the noose.

JALAP, in medicine, the root of the *Convolvulus Jalappa*, L. an exotic species of bindweed.

This root is imported in transverse slices from Xalapa, in South America. The best pieces are compact, hard, weighty, of a dark colour, and have black striated circles. It is frequently mixed with slices of briony-root, which, however, may be easily distinguished by their paler colour and porous texture.

Jalap possesses no smell, and leaves very little taste upon the tongue; but, when swallowed, it affects the throat with a sense of heat, and occasions a plentiful discharge of saliva. It is advantageously employed in various disorders, but chiefly as a purgative; for which purpose from 15 to 30 grains, and upwards, are taken in powder: its action, in general, is mild, without causing nausea, or gripes, except in hot, bilious habits, and hypochondriacal cases: nor should it be indiscriminately given to children or young persons, whose bowels it relaxes, and at length destroys the appetite.

JAMES'S POWDER.	Parts.
Oxyd of antimony	7
Pulverised bone ashes	4
Sulph. of potash	4½
Free potash	3½
Composed of parts	19

To recompose it take

Sulphuret of antimony	4
Calcined bone ashes	3
Saltpetre	8

Mix and subject them to a strong heat in a crucible.

The Pulvis Antimonialis of the English dispensatories is very similar to James's Powder.

JAPANNING, the art of varnishing

and drawing figures on wood, in the manner practised by the inhabitants of Japan, and other parts of India. It may be applied to almost every substance that is dry and rigid; such as leather, metals, and even paper, previously adapted for the purpose.

If wood or metals are to be japanned, it is sufficient that their surface be smooth and clean; but leather requires to be carefully stained on frames, to prevent it from cracking, and consequently parting with the coats of varnish. Paper is managed in a similar manner, and is generally coated over with some kind of *size*. The japan is then laid on; but as this art is in the hands of extensive manufacturers, and is, besides, too expensive to be practised for amusement, we shall only mention a patent which was lately granted to Mr. JOSEPH EYRE, of Sheffield, for a method of impressing japan upon the ornamented handles of knives and other articles. His process is very simple: as soon as the pattern is impressed on the handle, &c. it is taken out of the press (being previously marked, so that it may be replaced in the same situation,) and the japan laid on. The press is then heated to a certain degree, and the japanned article returned to it; by which means the varnish is pressed in, rendered more firm, and made capable of receiving a high polish. This method is applicable to ornamented handles of knives, forks, &c. made of wood or paper, in imitation of carved horn or bone. See VARNISH.

JASMINE, or JESSAMINE-TREE, *Jasminum*, L. a beautiful exotic plant, consisting of nine species, three of which are reared in England, &c.

1. The *officinale*, or Common White Jasmine, with shrubby, slender, long stalks and branches, which grow, when supported, to the height of 15 or 20 feet: it has numerous white flowers, that blow at the extremities or points, and emit a very agreeable odour, especially in the evening. The Italians prepare a fragrant oil from these flowers, by the following easy process: Cotton-wool is previously soaked in bonduc-oil (*Oleum Behen*,) which possesses no flavour whatever; a thin layer of such cotton is then placed in a glass vessel, and a stratum of flowers over it; another parcel of cotton is spread over the latter, and this alternate stratification repeated every day, till the oil is completely saturated with the grateful odour of the jessamine; when the whole is carefully expressed. It is worthy of notice, that neither spirits nor water will combine with this favourite perfume; and that there is no other method of fixing it than by means of vegetable oils.

2. The *fructicans*, or Shrubby Jasmine, which has long shrubby, trailing stalks and branches, on the sides and ends of which appear yellow flowers, in the month of June. This species is remarkable for the numerous suckers which spring from its roots, and overspread the adjoining ground, if they be not annually taken up: its branches and leaves impart a fine citron colour to cloth previously immersed in alum water: but solutions of tin and bismuth produce a much brighter shade.

3. The *humile*, or Dwarf Yellow Jasmine, has firm stalks, low bushy branches, and produces yellow flowers in the month of July. The whole plant yields a fine olive colour, if the wool or cloth be first prepared in a solution of green vitriol.

All these species thrive in our gardens, and are easily propagated by layers and cuttings; but they require a warm, and rather humid soil. Beautiful shrubs may be produced, by inoculating the first species with that called *grandiflorum*, or the Great flowered Catalonian Jasmine.

JAUNDICE, or *Icterus*, a disease in which the skin and eyes are yellow: the feces of a whitish colour; and the urine of a dark red hue, tinging cloth or other substances immersed in it, of a yellowish shade.

Various causes produce this obstinate disease; such as a very diluted and acrid state of the bile; indurated swellings of the intestines; the colic, when occasioned by eating unripe fruit; accumulations of humours near the liver; suppression of the natural evacuations, &c. It may also arise from coarse and unwholesome food; as well as from the effects of fear, terror, anger, or any other passion; and likewise from suddenly drinking cold water, while the body is overheated.

Persons of a sedentary life and sanguine temperament, especially females, are liable to be attacked by the jaundice. Even infants become subject to the disease, if the breast be given them, while the mother is under the influence of passion.

The chief object, in curing the jaundice, is to remove the cause which occasions the accumulations of bile and humours at the liver; for this purpose gentle emetics should be frequently taken, and constant exercise on horseback; which, from their concussion of the viscera, dislodge the obstructing matter, and thus remove the complaint. But, if there be any tendency to inflammation, the patient ought to lose a little blood, previously to taking any emetics. Should, however, no relief be obtained after two or three vomits have been administered, it will be advisable to delay the repetition.

[Purgatives of calomel and jalap, and frequent potions of strong soda water, are the best means of cure. —T. C.]

JAUNDICE, in *horses*, a disorder which is by farriers usually called the *yellows*. It is divided into two species, the *yellow* and the *black*. In the former kind, the whites of the animal's eyes assume a yellowish cast; his tongue and his lips also partake of the same colour, though in a slighter degree. In the *black* jaundice, those parts are tinged with a blackish hue. The remedy consists of purges and alkalies.

JAW, or **JAW-BONE**, in anatomy, is the bone which contains the teeth within their sockets.

The jaw is liable to a variety of disorders, occasioned by colds or other accidents: the most fatal are, 1. The dislocated and fractured jaw, the treatment of which, being merely chirurgical, is foreign to our purpose; and, 2. the LOCKED JAW, or *Trismus traumaticus*, which is a spasmodic rigidity chiefly of the under jaw.

This alarming complaint attacks persons of all ages, and is frequently fatal in the East and West Indies. It is generally occasioned by sudden colds; wounds of the nerves, and nervous parts of the body, however slight: drawing of the teeth, and affections of the gullet or wind-pipe. Suppression of the erysipelas or rose, hysterics, rheumatism, worms, and the bite of venomous serpents, are among the many causes of this dangerous disorder.

In the United States, this dreadful disease most commonly proceeds from the following causes.

1. Wounds from nails, or other pointed instruments, in the hands or feet. When these occur, warm spirits of turpentine, or common salt must be applied, and the wound enlarged, if the remedy cannot reach to the bottom. The object is to raise a slight inflammation, which will prevent the general affection. The irritation should be kept up for ten or fifteen days, when the wound may be permitted to heal.

If symptoms of the disease appear, whether the local application has, or has not been made, the wound must be immediately enlarged, and filled with the above stimulating applications, or powdered cantharides (Spanish flies.) *If the patient be robust, some blood may be advantageously taken away:* cold water must then be dashed every twenty minutes upon the body, which must be rubbed dry, and the patient put to bed.

Wine must be freely, but regularly given, and alternated with brandy and water; when the former ceases to produce an effect, oil of amber may then be substituted. Opium internally does no good, but externally applied in the form of laudanum, is highly beneficial; sweet oil may also be rubbed over the throat with great advantage. When the violence of the disease has subsided, Peruvian bark may be freely given, with generous diet. The warm bath must never be used.

2. The second cause from which this disease proceeds in the United States, is, *exposure of the body to night air, after being much heated.*

The general treatment is the same, as in the former case, except that when a sickness at stomach occurs, *an emetic should precede the use of other remedies.*

The quantity of stimulants, which a sufferer in this complaint will take without injury, is immense: the only rule to be observed with regard to their administration, is, to give them in *regularly increased doses* until the desired effect be produced. An obstinate costiveness attends the disease, and is very difficult to remove. Calomel in doses of ten or fifteen grains with as many of jalap, or clysters of tobacco water may be given. A salivation quickly raised, has frequently proved a cure.

Dr. MEASE has been particular upon this awful complaint, because it is one which is very frequently fatal in the country, during the summer season.

During the continuance of this spasmodic disease, the patient can only receive sustenance through his teeth, or by means of nutritive clysters. His food ought, therefore, to consist of the most nourishing broths and jellies: thus, by the judicious application of the different remedies above stated, and by carefully avoiding to take cold, the locked jaw may probably be restored to its former situation, in the course of a few days.

JAY, or *Corvus glandarius*, L. a well-known British bird, remarkable for its beauty. It is about 13 inches in length; its forehead is white, streaked with black; the head is covered with a tuft of long feathers, which the bird erects at pleasure into the form of a crest: the whole neck, back, breast, and belly, are of a faint purple colour, intermixed with grey.

Jays build chiefly in woods, where they construct their nests with sticks, fibres of roots, and tender twigs, in which the females deposit from five to six eggs, of a dark olive colour. They feed on acorns, as well as every kind of grain, and are very mischievous, frequently destroying young chickens and eggs: nor do they spare birds that have been caught in a trap, or entangled in bird-lime. The most effectual method of taking them is that already pointed out in the article JACK-DAW.

ICE, water in a solid state. When the water is exposed to a temperature below 32° of Fahrenheit, (see THERMOMETER,) it assumes a solid state by shooting into crystals, which cross each other in angles of 60 degrees. Ice is always found at the same temperature or 32°; it is lighter than water, of course its bulk is larger than that of water of which it is formed, and this increase of dimensions is acquired with prodigious force, sufficient to burst the strongest vessels. There is a grotto in France, about seven leagues from Besançon, distinguished from all others by a very singular phenomenon: in summer, ice is constantly formed in it, in large quantities, and this ice diminishes at the approach of winter. The rock forming the roof of this cavern is lower than the neighbouring plains, and the grotto itself is covered with bushy trees, from the leaves of which evaporation is constantly going on. In consequence of this evaporation, the ground is so far cooled in the summer as to occasion freezing in the cavern, in the same manner as water in porous jars is cooled in hot countries, by evaporation from the outsides: when by the fall of the leaves, evaporation is checked, the temperature of the cavern rises, and the quantity of ice is diminished.

Ice concretes generally on the *surface* of water; but this effect frequently varies under different circumstances. In the northern parts of Europe, there are three species of ice: 1. That which is formed on the surface. 2. Another kind, which congeals in the *middle* of the water, and bears some resemblance to small hail; and, 3. *Ground-ice*, that is produced at the bottom; especially where it meets with any fibrous substance to which it may adhere. The last species is full of irregular cells; and, on account of its inferior specific gravity, it produces many singular effects, by bringing up heavy bodies from the bottom of the water in which it is formed. The ice that concretes in the middle of the water, rises to the top, where it unites into large masses: the formation, however, both of this, and of the *ground-ice*, takes place only during the intense and sudden frosts, in shallow waters, the surface of which is disturbed either by the wind or the current of a stream, so that it cannot be easily consolidated.

In many countries, the warmth of the climate renders ice not only a desirable, but even a necessary article: hence it becomes an object of some importance to procure it in a cheap and easy manner. For this purpose, in the East Indies, three or four pits are dug on a large open plain, each of which is about thirty feet square, and two feet deep; the bottoms are covered to the depth of eight or ten inches with dried straw, or the stems of sugar-canes On this bed are arranged, in rows, a number of unglazed pans m[illegible] of porous earth, about a quarter of an inch thick, and an inch and a quarter deep. which are filled about sun-set, with water that has been boiled and become cool. Early in the morning, a coat of ice is found on the pans, which is broken by striking an iron hook into its centre, and then conveyed in baskets to the place of preservation.

The most expeditious method, however, of producing ice, consists in a combination of *sal ammoniac* with *nitre*. It was first discovered by BOERHAAVE, whose experiments were repeated and confirmed by Mr. WALKER, apothecary to the Radcliffe Infirmary, Oxford; but he found that his thermometer sunk 32° in a solution of sal ammoniac, when BOERHAAVE's fell only 28°: nitre alone reduced it to 19°. On mixing the two salts, in equal proportions, the power of generating cold was considerably increased: so that the water was cooled to 22°, while the thermometer stood at 47° in the open air. By adding some powder of the same composition, and immersing in the mixture two small phials filled with water, he found it in a short time frozen.

Having observed that *Glauber's salt*,

when it retains the water of crystallization, produces cold in a state of solution, Mr. Walker made an experiment of its effects when mixed with the other salts before mentioned; in consequence of which the thermometer sunk from 69° to 19°, and he obtained ice, while the thermometer stood as high as 70°. Lastly, by previously immersing the salts in the water of one mixture, and then making another of the cooled materials, he was able to sink the mercury in the thermometer to 64°. Thus, he froze a mixture of spirits of wine and water, in the proportion of seven of the latter to one of the former: and, by adding a quantity of the cooled materials to the mixture in which this was frozen, the quicksilver fell to the extraordinary depth of 69 degrees.

Various other methods of procuring artificial ice have been contrived, particularly by the aid of æther; but that volatile spirit is too expensive for domestic purposes, and a satisfactory account of the process would exceed our limits.

Ice has lately also been introduced into medicine; and its external application was attended with success in various disorders, especially in typhus fever, acute rheumatism, strangulated ruptures, and chronic inflammations of the eyes, after proper evacuations had preceded. It has likewise been advantageously employed for removing a retention of urine; and an instance lately occurred, in which a person was effectually relieved, by immersing his legs for five minutes in a pailful of ice and water taken fresh from the river. At first it occasioned intense pain, but in a few minutes after the patient had retired to bed, his complaint was alleviated; and, in the course of twelve hours, he was perfectly restored. Such a powerful remedy, however, should be resorted to only under medical superintendance.

Ice-Boat. See Boat.

ICE-CREAM, is prepared by mixing three parts of cream with one part of the juice or jam of raspberries, currants, &c. The mixture is then well beaten; and, after being strained through a cloth, is poured into a pewter mould or vessel, adding a small quantity of lemon juice. The mould is now covered, and plunged in a pail about two-thirds full of ice, into which two handfuls of salt should be previously scattered. The vessel containing the cream is then briskly agitated for eight or ten minutes, after which it is suffered to stand for a similar space of time; the agitation is then repeated, and the cream allowed to subside for half an hour, when it is taken out of the mould, and sent to table.

ICE-HOUSE, a repository for the preservation of ice during the summer months.

An ice-house may be built at a very great expense, but it may also be built for a sum, which no farmer, however poor, ought to object to. If *he wish one*, he *may have it*. At Gloucester Point tavern, below Philadelphia, on the banks of the Delaware, is an ice-house, which fully shows with what little expense, how simple the manner, and under what supposed disadvantageous circumstances, an excellent ice-house may be built.

The ice-house alluded to, is sixteen feet square; four feet above, and nine feet below the surface. The marshy nature of the soil, does not permit a greater depth. The pit, which slopes a little, is lined with logs, as far as the surface, and faced with slabs, which are continued above ground. There is a sink at the bottom covered with logs, upon which the ice rests, and this sink empties into a pipe, which conveys the water of the melted ice, or of the river, to a hogshead sunk about eight or ten feet from the corner of the house, whence it is pumped up by a common ship pump. A thick bank of earth is thrown up outside, as high as the ice extends. The roof is boarded; and the entrance is through a small door at the gable end, next the tavern, which is south of the ice-house, and but four feet from it. Straw is liberally used to cover the ice, and to line the pit. A large willow shades the ice-house on the north-east, and west; and the tavern protects it on the south. The ice-house holds ninety-one one-horse-cart loads, and keeps ice enough to supply the house until the succeeding winter, in which it is filled.

The Gloucester ice-house may be considered as a valuable model for all those who wish to enjoy this summer comfort, and who live in marshy countries. But in dry situations, other plans may be adopted. The following is recommended by Mr. Thomas Moore, of Montgomery county, Maryland, in his late excellent treatise on the subject.

"The most favourable situation is a north hill side, near the top. On such a site, open a pit twelve feet square at top, ten at bottom, and eight or nine feet deep: Logs may be laid round the top at the beginning, and the earth dug out, raised behind them, so as to make a part of the depth of the pit. A drain should be made at one corner; the spout to carry off the water should descend from the pit except a short piece at the outward extremity, which ought to rise thus, the depressed part will always stand full of water, and prevent communication with the external air. Dig holes in the bottom of the pit, and set therein four perpendicular corner posts, and an intermediate one on each side; let the insides of these posts form a square of eight feet in the middle of the pit. Then, in order to avoid dampness from below, cover the bottom three or four inches deep with dry sand, if it can be conveniently got. The next thing to be done, I consider as the most material, and also expensive part of the business; which is fixing a proper floor for the ice to rest on. In order to do this, let three or four sleepers, supported at the ends, be placed across the square included by the posts; their upper edges about a foot from the bottom, but so that the plank laid thereon, may have a descent of a few inches towards one of the sides next the drain. The plank should be two inches thick, and about half seasoned; jointed, grooved, and tongued or lathed, and grooves cut near the joints, in the upper side so as to prevent any water from going through. The floor must extend a little without the inner sides of the posts; so that the water dripping from the sides may fall on the floor. Then fix a plank or spout at the lower end of the floor, in such a manner as to convey the water into the drain. The floor being completed, begin at the bottom, and plank up on the insides of the posts with 3-4 or 5-8 plank, lapping the lower edge of each a little on the one below, so that the water may be kept on the inside: this done to the top of the posts (which should be even with the top of the pit) and the inside will be completed; except that it will be proper to cover the floor with loose plank previous to putting in the ice. The roof may be composed of any materials, and in any form that will defend the contents of the pit from wet, from the direct rays of the sun, and also admit a free circulation of air: I do not think any could answer the purpose better than one made of thatch, supported by posts a few feet from the ground.

The mode of filling the house remains now to be considered; and on this much depends.

Early in the winter fill the interstice between the ice chamber and the bank with clean dry straw closely pressed; this being done early, will prevent the earth from freezing: which would be injurious to the sides of the pit. The ice should be collected in the coldest weather; let it be exposed at least one night to the cold atmosphere after it is removed from the water: which will reduce its temperature many degrees, if the weather is severe. When put into the house, it should be beat small, and I think it would be useful frequently to sprinkle it with a watering pot whilst putting in: the mass would by that means be rendered more compact. When the chamber is filled, cover the whole with a good thickness of straw; but I should suppose it would be best to cover the ice first with plank, supported by the sides of the chamber, only leaving a door to descend through.

Such a house as has been described, will contain about ten tons, and I am persuaded will be found sufficient to afford an ample supply for almost any private family.

This is nearly the kind I had in view when I estimated the expense would not exceed twenty dollars; and if we calculated on a great part of the work being done by the family; which in the country in general it very well may; the actual out lay, in many places, need not be five dollars. Those who are less sparing of expense, if they choose, may wall, or what is better, plank up the sides of the pit; and finish the roof in a style of elegance.

In level situations, where a drain cannot be conveniently dug out from the bottom of the pit, I should suppose it would answer very well to enclose the ice by a mound raised entirely above the surface of the earth, through which the water may be discharged; in other respects to be similar to the foregoing description. This perhaps would not be quite so cool a repository as if under the surface of the earth; unless the mound was very thick; but I am persuaded that the loss of a few degrees in temperature bears very little proportion to the advantage resulting from dryness.

If it were certain the floor would be perfectly tight, the passage of heat to the ice would be rendered still more difficult by confining a quantity of dry ashes, saw-dust, straw, or some other non-conductor between the floor and the bottom of the pit."

In Italy, where ice is much used, both as a medicine and in diet, it is formed in the following manner. Balls of snow are wetted, and placed one on another in the ice-house. The bottom parcel rests on logs, through the interstices of which the dissolved water drops; and the whole mass is formed into a solid body of ice in the course of the winter.

The following points should be carefully attended to in building an ice-house:

1. Whether the pit be lined with stone, brick, or logs, a vacancy should be left, of at least one foot, between the surrounding earth and lining, and filled with straw. The quality possessed by straw of slowly conducting heat, is advantageously acted upon, in many instances by those who are ignorant of the principle, which is finely illustrated and proved by Count Rumford. A second wall, leaving less space between it and the first, than between this and the surrounding earth, and likewise filled with straw, would tend more effectually to exclude the heat, which is commonly observed to cause great waste of ice at the sides. Straw should likewise be liberally used between the wall and body of ice.

2. A chimney, to convey away the heated moist air, is an essential requisite to all ice-houses not much used, and which are placed in unfavourable situations: it is the want of this chimney which occasions the disappointment of many persons, anxious to preserve a supply of ice in summer.

3. Mr. Moore suggests the probability of a thatch roof being equal to any, for the purpose of covering an ice-house; but there can be no room to doubt of *straw* being the *very best* material for a roof within reach of the farmer. If a single roof be used, the thatch should be as thick as possible, but a double roof (each roof being thatched) would more completely keep out external heat. Where the roof consists of boards or shingles, the inside may be covered with straw, to be supported by battens.

In South Carolina and Georgia, where the ice must be imported from the northern states, and still greater precaution is necessary, the space between the double roof may be lined with powdered charcoal, or ashes, which are well known to be the worst conductors of heat. The body of charcoal need not be more than six inches thick.

4. A floor over the body of ice would further protect it from waste, by excluding heat. This floor should be covered with straw, and also have a door, to enable a person to descend to the ice.

5. Ice-houses should be filled in the coldest weather. and the ice broken into lumps about the size of a man's head. Cold water may be dashed on every layer of ice, but *salt must not be used.* During very cold nights, the door of ice-houses should be left open.

6. Pits for ice-houses should be dug down to gravel, or have a drain to carry off the dissolved water.

Ice is not only a great comfort in summer, but may be rendered essentially profitable to the farmer, by enabling him to take butter and meat to market in such order, as to command an extraordinary price.

A very simple plan has been contrived, for this purpose, by Mr. Moore, before mentioned, and thus described in his treatise on ice-houses.

"I had a cedar vessel made in the form of an oval tube nearly as wide at bottom as top; in this was fitted as large a straight-sided tin vessel as it would contain, open at top. The interstices between the sides of the two vessels were covered by an edging of tin, soldered to the upper edge of the tin vessel, and extended on to the upper edge of the wooden vessel, to which it was nailed, (but this edging ought to have been wood.) Through this last was cut a hole about an inch and a half space on each side, for the purpose of putting in ice; over the whole was fitted a wooden lid fastened by a hinge on one side. A coat or case of coarse cloth lined with rabbit skins, the fur side next the cloth and the pelt next the wood: the coat was in two parts for the convenience of raising the lid: the part attached to the lid, had an edging which hung down and covered the joint when shut. The tin vessel was 14 inches long, 6 wide, and 12 deep, and contained 22lbs. of butter wrapped in linen cloth, and put in edgways."

Machines upon the principle of that just described may be applied, as Mr. M. observes, to a variety of purposes in families. Mr. Moore's inventions are secured by patent.

[*A portable ice-house.* A well-framed wooden box, 6 feet by 3 feet and 3 feet.

Another wooden box 2 inches larger every way. Put the smaller into the larger, surrounded by charcoal dust at bottom and on the sides; a cover to fit close; a hole at one corner to let out any water of melted ice; with a cock or plug. At the first frost, put in 2 inches of water: add to it during the winter till it be frozen solid, cover it. Throw a blanket over the top. Put it under a shed so as to be screened from the sun.

Professor LESLIE makes ice by means of oil of vitriol in a shallow vessel under an air pump. The evaporation produced in water by working the pump, is absorbed instantly by the strong acid, so that the cold produced by quick evaporation is sufficient to freeze water. Very dry earth and other substances that will quickly absorb water, have been tried by him with good effect.

[On the formation of ice in the bottoms of rivers, see a paper, by T. A. KNIGHT, Esq. *Phil Trans.* for 1816. Part 2. The watermen on the Thames usually feel ice at the bottom with their poles, before it appears on the surface.—T. C.]

ICHNEUMON, (*Viverra ichneumon*) a quadruped somewhat more than three feet in length, of which the tail, which is thick at the base, tapering, and tufted at the extremity, is nearly half: the hair is hard, coarse, and of reddish grey colour, and the great toes are remote from the others.

It is found in Egypt, and particularly in those parts of that country which are adjacent to the banks of the Nile. It is also found throughout nearly all the southern parts of Asia.

To the inhabitants of Egypt the ichneumon is an animal of great importance. Being a natural enemy of the whole serpent race, and of other noxious reptiles which infest that country, it unsparingly attacks and destroys them. It combats without dread that most fatal of all serpents, the cobra di capello, and the address with which it seizes this and other serpents by the throat, in such manner as to avoid receiving any injury itself, is very remarkable. It digs the eggs of crocodiles out of the sand; and even kills and devours great numbers of the young of those tremendous and dreaded creatures. Both in India and Egypt the ichneumon is domesticated and kept in houses, where it is found more serviceable than a cat in destroying rats and mice. It is easily tamed, and very active, and springs with great agility on its prey. For its various services, but more especially in the destroying of crocodiles, it was ranked by the ancient Egyptians amongst their deities, and received the honours of divine worship.

These animals grow rapidly, but are short-lived. In a wild state they chiefly inhabit the banks of large rivers. When they sleep they fold themselves up like a ball, and are not easily awaked. They sit upright, and use their fore feet in eating; and they catch with the facility almost of a monkey any thing that is flung to them.

ICHNEUMON, a genus of insects of the Hymenoptera order. There are said to be 500 species included in this genus, separated into families. The whole genus has been denominated parasitical, on account of the very extraordinary manner in which they provide for the future support of their offspring. The fly feeds on the honey of flowers, and when about to lay eggs, perforates the body of some other insects, or its larvæ, with its sting or instrument at the end of the abdomen, and there deposits them. These eggs, in a few days, are hatched, and the young nourish themselves with the juices of their foster-parent, which, however, continues to move about and feed till near the time of its change to a chrysalis, when the larvæ of the ichneumon creep out by perforating the skin in various places, and each spinning itself up in a small oval silken case, changes into a chrysalis, and after a certain period they emerge in the state of complete ichneumons. The catterpillar of the common white cabbage butterfly may be given as an example.

ICHTHYOLOGY, in zoology, a system of natural history of fishes. In the Linnæan system of zoology, fishes compose the fourth class, and are distributed into four orders, distinguished by the conformation, or want, of fins.

Orders.	Examples.
1. *Apodes.*	Eel.
2. *Jugulares.*	Cod.
3. *Thoracici.*	Perch.
4. *Abdominales.*	Salmon.

From this arrangement, the whale, dolphin, &c. are omitted; these being comprehended in the class of *mammalia.*

To these are to be added the cartilaginous fish, which are separated into two orders, viz. the branchiostegeous or fishes that have gills without bony rays; and the chondropterigious or those that have cartilaginous gills: the *sucker* belongs to the former, and the squalus or shark to the latter.

Pennant has given another system. This naturalist makes three divisions, each of which comprehends several genera:

Divisions.	Examples.
Cetaceous.	Whale.
Cartilaginous.	Picked dog-fish.
Bony.	Cod.

That fishes swim by means of their tails, and preserve their equilibrium with their fins, is an observation generally known; but the power of raising and lowering themselves in the water has been supposed to be owing to the air-bladder, a membranous bag, filled with air, situated towards the back of the fish, and opening into the gullet. It has been proved in the instance of the carp, that if the air-bladder is ruptured, the fish can never after rise from the bottom of the water; but the general conclusion that might be drawn from this fact, is rendered eminently questionable, by the no less positive facts, that all the cartilaginous fishes, though they rise and sink with facility, are without the air-bladder: and that the eel, which has it, is scarcely able to leave the bottom.

The way in which the air-bladder is thought to enable the fish to lift and depress itself is this: by swelling, at the pleasure of the animal, it increases the surface of its body, and thus diminishes its specific gravity; by contracting, it increases it.

ICOSANDRIA, see Botany. The icosandria class furnishes the pulpy fruits that are mostly esteemed, such as apples, plums, peaches, cherries, &c. whereas the polyandria are mostly poisonous, as the aconite, columbine, larkspur, hellebore, and others.

JELLY, a form of food, prepared either from the juice of ripe fruits, boiled to a proper consistence with sugar; or without it, from the flesh, intestines, or bones of animals, which are stewed so as to become perfectly stiff and firm when cold.

The jellies of fruits are cooling, and acescent; in all disorders of the first passages, they are of eminent service, especially when diluted with water. On the other hand, those prepared from animal substances are very nourishing, and useful to invalids.

JET, a black inflammable concrete which becomes electrical by friction; attracts light substances, in the same manner as amber, and when burning, emits a bituminous smell. It has the grain of wood, is but moderately hard, and splits most easily in a horizontal direction.

Jet is always found in detached masses, lodged in transition strata; it abounds no where so plentifully as in England, being very common in Yorkshire, and other northern counties, though it is also discovered in many clay-pits about London. Ireland, Sweden, Prussia, Germany, and other parts of Europe, as well as the East-Indies, produce this fossil. It admits of a high polish, and is chiefly converted into small boxes, buttons, bracelets, and other toys. In conjunction with oils, it forms an ingredient in varnishes; and, when mixed with pulverised lime, it is said to produce a hard and durable *cement*.

IGNITION, is that emission of light produced in bodies by exposing them to a high temperature, and which is not accompanied by any other chemical change in them. It may be distinguished from combustion, a process in which there is also the emission of light and heat. Combustion is the result of the chemical action of the air, or of a principle which the air contains, hence combustible bodies are alone susceptible of it, and when the process has ceased, the body is no longer combustible. Ignition is an effect of the operation of caloric alone, wholly independent of the air.

ILEX, the holly, in Botany, of which there are sixteen species. The Ilex aquifolium, or common holly, is usually from twenty to thirty feet in height, though it sometimes grows to double that size. Mr. Millar discovered the difference of sexes in the flowers of the common holly. The wood of this tree is the whitest of all hard woods, and used for inlaying, especially with ivory. The millwright, turner, and engraver prefer it to any other. It is used with box, yew, and white thorn, in the small trinkets and other works carried on about Tunbridge, commonly called Tunbridge-ware. Birds eat the berries of the holly, and the bark, fermented, and cleared of the woody fibres, makes the common bird-lime.

ILIAC PASSION, or *Ileus*, one of the most dangerous maladies with which mankind is afflicted, and in which the motion of the bowels is totally inverted. It generally arises from spasms, or obstructions in the alimentary canal, by which the passage or descent of the excrements is impeded; an unnatural stricture of the intestines, ruptures, &c. violent exertions of the body, such as leaping, running, or riding; the lifting of great weights: eating of unripe fruits, especially pears and nuts; the drinking of sour and ill-fermented liquors; the use of too strong laxatives, worms, and obstinate costiveness, are among the many causes which generate this fatal disorder.

Where the iliac passion proceeds from a distortion of the intestines, there is little hope of recovery. Various remedies, however, have been used, with different degrees of success. Thus, large blisters, applied to the most painful part, while emollient clysters are injected; fomentations; camphor externally and internally; ipecacuanha in the smallest doses frequently repeated; linseed oil, both in small draughts, and in the form of clysters; as well as the warm bath, have all been found sometimes of service, but more frequently unavailing. And though experience has but too often evinced, that this obstinate disorder is not under the control of medicine, yet it may, in many instances, be arrested in its progress, and perhaps eventually cured, when a just *diagnosis* can be formed of its nature.

Frequent and copious bleedings, repeated clysters of cold water, oily injections, blisters to the bowels, and in cases of obstinate costiveness, *dashing cold water upon the feet*, are the most effectual remedies for this disease.

Quicksilver has been often recommended, and may be tried when other remedies fail.

ILLICIUM, a genus of plants, consisting of two species, viz. the illicium anisatum; and illicium floridanum. The whole of the first mentioned plant, especially the fruit, has a pleasant aromatic smell, and a sweetish acrid taste. It is used for seasoning dishes, and in Japan they place bundles and garlands of the aniseed tree in their temples before the idols. The bark, finely powdered, is used by the public watchmen to make chronometers for measuring the time, by slowly sparkling at certain spaces in the box, in order to direct them when the public bells are to sound.

ILLUMINATING, a kind of miniature painting, formerly practised for illustrating and adorning books. The writers of books first finished their part, and the illuminators embellished them with ornamented letters and paintings.

IMAGE, in optics, is the appearance of an object made either by reflection or refraction. In *plane* mirrors, the image is of the same magnitude as the object, and appears as far behind the mirror as the object is before it. In *convex* mirrors, the image is less than the object, and farther distant from the centre of the convexity, than from the point of reflexion. See Optics.

IMMERSION, in astronomy, is when a star or planet is so near the sun with regard to our observations, that we cannot see it, being as it were hidden in the rays of that luminary. It also denotes the beginning of an eclipse of the moon, and of the satellites of Jupiter. The eclipses of the first satellite of Jupiter are much used for discovering the longitude. The immersion of that satellite is the moment in which it appears to enter the disc of Jupiter, and its emersion the moment when it appears to come out.

IMPATIENS, a genus of plants, of which there are twelve species. The impatiens noli tangere, common yellow balsam, is an annual plant; during the day the leaves are expanded, but at night they hang pendant, contrary to what is observed in most plants, which from a deficiency of moisture, or a too great perspiration from heat, commonly droop their leaves in the day-time. When the seeds are ripe, upon touching the capsule they are thrown out with considerable force, hence its name.

IMPLEMENTS *of Husbandry*, denote those machines or instruments which are used in the different branches of rural and domestic economy; such as ploughs, harrows, hoes, churns, threshing-machines, straw cutters, &c.

IMPRESSIONS *of Leaves, Plants, &c.* Take half a sheet of fine wove paper, and oil it well with sweet oil; after it has stood a minute or two, to let it soak through, rub off the superfluous oil with a piece of paper, and let it hang in the air to dry; after the oil is pretty well dried in, take a lighted candle or lamp, and move the paper slowly over it, in an horizontal direction, so as to touch the flame, till it is perfectly black. When you wish to take off impressions of plants, lay your plant carefully on the oiled paper, and lay a piece of clean paper over it, and rub it with your finger equally in all parts for about half a minute; then take up your plant, and be careful not to disturb the order of the leaves, and place it on the book or paper, on which you wish to have the impression; then cover it with a piece of blotting paper, and rub it with your finger for a short time, and you will have an impression superior to the finest engraving. The same piece of black paper will serve to take off a great number of impressions; so that when you have once gone through the process of blacking it, you may make an impression in a very short time.

The principal excellence of this method is, that the paper receives the impression of the most minute veins and hairs; so that you may take the general character of most flowers, much superior to any engraving. The impressions may afterwards be coloured according to nature.

INARCHING, in gardening, is a method of engrafting, denominated *grafting by approach;* and is employed when the stock intended to graft on, and the tree from which the scion is to be taken, are situated so near that they may be easily joined.

This operation is performed in the month of April or May, in the following simple manner: The branch designed to be inarched, is exactly fitted to that part of the stock with which it is to be united, after having previously pared away the rind and wood on one side of both the stock and branch, about the length of three inches, that they may uniformly combine, and thus promote the circulation of the juices. A little tongue is then cut upwards in the graft, and a notch made in the stock for inserting it; so that when they are joined, the tongue will prevent their slipping, and the graft more closely adhere to the stock. They are next tied with some bass or worsted; and, to exclude the air from the wounded part, it is covered over with grafting clay. Lastly, both the graft and stock are fastened to a smooth and proportionate stake, which is driven into the ground, in order to withstand the effects of high winds, that would otherwise displace them. After having remained in this situation about four months, they will be sufficiently combined, and the graft may then be separated from the mother-tree; sloping it close to the stock, and laying fresh clay around the wounded part.

Inarching is chiefly practised with oranges, myrtles, jasmines, walnuts, firs, &c. which do not flourish by the common mode of engrafting. It ought, however, on no account to be performed on such orange trees as are designed to grow to a considerable size; for they seldom *live long* after this operation.

Inclosures. See **Commons**, **Fence**, and **Hedge**.

INCOMBUSTIBLE CLOTH, is the name of a species of cloth which resists the action of fire. It has been known for many centuries, that a mineral substance called asbestos can resist the action of fire: and that some species admit of division into fine slender threads of a lanuginous appearance. These in general are very short and brittle, but with careful attention in the separation, they may be obtained several inches in length.

A few years ago, the art of making incombustible cloth was completely revived by M. Perpenti, an Italian lady, who has improved on the process of all her predecessors. Having seen a distaff of asbestos, from the ruins of Herculaneum, in the cabinet of natural history belonging to the canon Cæsar Gattoni at Como, she was made acquainted by him with the different methods which the ancients are supposed to have adopted in making cloth. On inspection also, she remarked that their asbestine cloth was fabricated of double threads, in order to be of greater strength. M. Perpenti began by beating the asbestos, and steeping it in oil and in water, whereby the threads became more pliant; but finding them too much relaxed for weaving by the oil, she abandoned this method. She restricted her operations to softening it in water, drying it in the sun, and then carding it like wool. A very close toothed steel comb was used in carding, as the filaments were thick and short; and in this way she succeeded in obtaining a weak and unequal thread, with which, nevertheless, she was able to make a pair of gloves. Much difference, however, is to be found in the nature of the asbestos itself. Ciampini had before remarked, that although the asbestos of Cyprus is reputed the best, it in fact proved the worst; and what was most suitable came from Corsica. M. Perpenti first used asbestos from the mountains of the valley of Malenco in the Valteline, which proved to be better than what was procured from the environs of Genoa. In the former, she observed, there were threads much longer than the piece of asbestos containing them; whence it became important to devise some method whereby they should be detached and unravelled. Here also M. Perpenti was successful, for by rubbing the asbestos, and disengaging the two ends of the threads, she thus obtained some of the greatest beauty, and suitable for the most delicate work. These were several feet long, and equally fine and strong as silk or linen thread. It was the more singular that such should be the case, as a piece of asbestos, to external appearance, exhibits only a mass of thick short threads, which has always been the chief obstacle to the fabrication of incombustible cloth. All the previous preparation, therefore, which is necessary, is confined to softening the asbestine substance in water, beating it to create greater flexibility, and employing the iron comb. The threads acquire greater consistence, by moistening the finger with a little oil or gum while they are spun.

Incombustible paper. Those who have occupied themselves with the subject of incombustible cloth, have also directed their attention to the fabrication of incombustible paper from asbestos. Kircher proposes a certain process for it, which we do not discover he adopted. Some was made of Welsh asbestos towards the close of the seventeenth century; and Ciampini thinks the shorter asbestine threads would answer this purpose. M. Perpenti found the asbestos of Genoa, which was less suitable for spinning, the best adapted for making paper, which she accomplished by washing and purifying it well. Some time ago, M. Sage exhibited before the French Institute, a leaf of incombustible paper, made twenty years before that period, by M. Levrier, of Lisle, the proprietor of a paper manufactory. It was not smooth like paper fabricated of flax, but had sufficient coherence, and if the ink employed was well gummed, would readily receive writing. When put among burning coals it was not consumed; it assumed a greyish colour from the glue, and the written characters appeared red. M. Sage regrets that M. Levrier had not received greater encouragement, as deeds on common paper might be preserved from the flames by inclosure in cases of asbestos; but Ciampini remarks, that it was no protection to a stick which he had enveloped in it. According to M. Perpenti's experiments, an indestructible ink may be obtained, by mixing a third of sulphate of iron with two-thirds oxide of manganese, the whole being well pulverised.

Indian Berry. See Cocculus *Indicus*.

INDIA-RUBBER, Caoutchouc, or Elastic-Resin, a substance produced from the *syringa-tree* of Cayenne, and other parts of South America. It oozes, in a milky form, from incisions made in the tree; and is chiefly gathered in time of rain, because it then flows in peculiar abundance. It is said to acquire the consistence in which it is seen in foreign countries, by mere exposure to the air. The Americans use it to make boots, which are impenetrable to water; and bottles, which they fasten to the ends of reeds. They also convert it into flambeaux, an inch and an half in diameter, and two feet long, which afford a brilliant light, and burn twelve hours. A kind of cloth is farther prepared from it, which supplies, to the inhabitants of Quito, the place of the oiled or tarred cloths of Europe. By means of moulds of clay, it is made into various useful and ornamental figures. This process is commenced by spreading it, while yet in a clammy state, over the moulds, in successive layers, till the desired thickness is attained. The figure is then exposed to the smoke of burning vegetables, which gives it a blackness of colour. Before it is perfectly hardened, it is also capable of receiving those impressions on the outer side, which are commonly seen.

Indian Turnip. See Turnip.

INDIGESTION, or *Dyspepsia*, a complaint which chiefly consists in the loss of appetite, and is generally attended with nausea, flatulence, vomiting, heart-burn, costiveness, as well as other unpleasant symptoms, without any immediate affection either of the stomach or other parts.

Indigestion arises from a variety of causes, such as the eating of hard, unwholesome food, and unripe fruit; drinking too large draughts of liquor during, or immediately after dinner, the immoderate use of opium, and of spirits; taking too large quantities of tea, coffee, or any warm relaxing liquors; tampering with emetics or laxatives; the want of free air and exercise; and in consequence of indulging in any of the depressing passions.

Persons of weak delicate habits, particularly the sedentary and studious, are frequently subject to indigestion. A radical cure of it can be effected only by removing the debility of the stomach and whole system. With this intention, emetics, or gentle purgatives, should be previously administered, in order to clear the alimentary canal. Next, tonics, such as valerian, Peruvian bark, &c. may be resorted to with advantage: and, if the complaint be accompanied with putrid eructations, or other signs of putrescency, it will be advisable to take the strongest *antiseptics*, especially the marine acid, or spirits of salt, sufficiently diluted with water. Many, however, have been effectually cured by the *liberal* use of cold water alone. In great laxity of the stomach, considerable benefit has been derived from the use of the columbo root, in small and frequent doses. The chalybeate waters are, to phlegmatic habits, in general, of great service; and the moderate drinking of sea water has often been productive of good effects.

Medicines, however, will be of little or no advantage, unless the patient take moderate and daily exercise in the open air, and endeavour to preserve a cheerful, contented mind. Early rising ought to form an indispensable part of his attention; while his diet should consist principally of solid but tender aliment, which he, from experience, has found easy of digestion.

[Indigestion is produced by too much food: by too stimulating food: by stimulating drinks: by unwholesome food, new hot bread, &c.: by want of exercise: by grief: by the use of tobacco, or other narcotics. *Cure:* Abstain from the causes. Take moderate purges: use little wine or spirits: eat no supper: use exercise.—T. C.]

INDIGO is a drug of a dark blue colour, used in dyeing, and prepared from the leaves and small branches of a low shrub, indigenous in the warmer parts of Asia and Africa, and now cultivated in those of America. The indigo is cut when in flower, the tips of the branches only being taken, and several cuttings made during the season.

In bringing in the slips, care is taken not to lose more of the pollen, or farina-fecundans, than necessity compels; this part of the plant being peculiarly valuable. The slips are thrown into a steeping vat, or large tub, filled with water. There it undergoes a fermentation, which is completed in twenty-four hours. The water is then drawn into another tub, called the mortar, and the vat being cleansed, is ready to receive a second supply of slips. The water that has run into the pounding-tub, is found impregnated with a subtile earth, which alone constitutes the substance, which is the object of the labour, and which must be separated from the salts of the plant, which are here useless. To effect this, the water is forcibly agitated with wooden buckets. These buckets are pierced full of holes, and fixed to a long handle. When it is perceived that the coloured particles collect together, by separating from the water, the agitation is discontinued, in order to allow them to precipitate to the bottom of the tub, where they are left to settle till the water is quite clear. Vents in the tub, pierced at different heights, are then successively opened, to let out the water. The particles, with the water that remains, having acquired the consistence of a syrup, this thick liquid is afterward drawn off into a settler. The superfluous water is here more completely drained away, and still, subsequently, filtered through a sacking cloth. The indigo is then put into chests, where it is gradually freed from all moisture; and, at the end of three months becomes fit for sale. Genuine indigo ought to be of a rich dark blue colour approaching to black; and, when broken, to display the lustre of copper. It should not sink in water, or leave behind any sediment after being dissolved. The purest indigo is brought from Guatimala in South America.

[*Blue colour from Indigo.*—Take 1 part of very fine indigo, powder it very accurately, and sift it through muslin. Dissolve it in 8 parts of strong oil of vitriol: the colour will be bad if the oil of vitriol is not very strong.—T.C.]

INDUSTRY, *Houses of,* are buildings erected in various parts of England in order to maintain the sick, infirm, and aged poor; while children and healthy adults, who are received into the house, labour for their support, and are allowed a certain part of their earnings, as an inducement to industrious habits.

These buildings, doubtless, contribute to the comfort of the poor, and are calculated to lessen the severe burden of parochial rates: they conduce to the rearing of an healthy, honest, and virtuous race of peasantry. Of this patriotic tendency is the Shrewsbury House of Industry; which, being excellently adapted to the purpose, has given birth to many similar institutions lately formed in various parts of Britain. We are no advocates for the toleration of *beggars*, who, under the imposing appearance of misery, extort alms from credulous charity: nor is it consistent with good policy to tolerate those hordes of idlers and drunkards, especially in the metropolis; for numbers of such as do strictly belong to the list of *mendicants*, might be very properly committed to the work-house, under the description of *vagrants;* because they prey upon the vitals of a deluded public. On the whole, however, we are of opinion, that industry would be more effectually promoted, if the poor were allowed to retain their little independence, and encouraged to persevere in their honest endeavours, by small bounties occasionally bestowed on them by the parish. At the same time, a comfortable provision might be made for the infirmities of age, by means of *friendly societies*, which, in the course of a few years, would supersede the necessity of building houses of industry. And, if those benevolent associations could be so organised that the rich and poor should contribute according to their respective abilities, we hesitate not to say, that the latter would be better assisted than they *can be* at present, on the irregular plan of parochial assessments, which, in too many instances, nearly *double* the rent of the premises. The opulent would become better acquainted with the *real* wants and miseries of the poor, while these would gradually acquire both principles and habits of industry: in short, they would thus be reconciled to their lot, and prosper under the management of the wealthy.

Many objections have been urged for and against houses of industry. Those readers who wish to peruse the arguments on both sides of the question, will derive equal amusement and information from Mr. Wood's pamphlet, entitled, *Some Account of the Shrewsbury House of Industry*, in which several objections are ably answered.

INFANCY denotes the first period of human life, previous to the age of seven years.

Having already treated of the diet proper for infants, under the article Food, and of their amusements, under the head of Exercise, we shall at present offer only a few remarks, chiefly relating to their dress.

The most fatal period to infants is, doubtless, during the two first years of their existence: for it has frequently been observed, that greater numbers die under that age than at any subsequent stage of life. This mortality is supposed principally to arise from the erroneous practice of confining their tender bodies, as soon as they behold the light, by means of tight bandages, so that neither the bowels nor limbs have sufficient liberty to act in the easy manner designed by Nature.

In order to obviate the abuses before mentioned, the infant's dress should be so contrived, that it be neither too warm nor too tight, and that not only the influence of the air may have its full effect, but also the motion of the body be duly facilitated. Hence a roller, about six or seven inches broad, should be made, either of linen or woollen cloth, as the season may require, though a knitted bandage would be far preferable; as, from its more elastic nature, it may with less pressure or constraint be turned round its body. It would be superfluous to enumerate the other parts of the *upper dress*, as every judicious parent will readily accommodate it to age and circumstances. The head should be lightly covered; and, while travelling, in cold or hot weather, a cap or hat may be safely used, but again laid aside, as soon as the infant returns to the house, or to a mild temperature, where every compression of the head is useless, and frequently hurtful. Indeed, the whole dress ought to be as loose as possible, because ruptures, and other fatal consequences, often originate from a contrary treatment.

Stockings are by many considered as unnecessary articles of the dress of infants; yet, as our offspring is not intended to go *bare-legged*, when adults, we conceive no reason for depriving them of proper hose, especially if they can be kept *dry*, and be adapted to the length of the foot, both in the winter and summer; though such covering will be more useful in the former season: their shoes also ought to be sufficiently wide. See Foot.

From the first moment of their existence, infants are liable to the attacks of disease. It deserves, however, to be remarked, that the descendants of sedentary, idle, nervous, or weak persons, are chiefly exposed; while those of the peasant and husbandman, being early inured to fatigue and hardships, are not only more healthy, but also less reduced by occasional indisposition, and better able to bear external injuries. We cannot, in this place, enter into any details respecting the management of infantine disorders, as they are discussed in the alphabetical series. (See also

Vitiated BILE:) hence we shall conclude these remarks with adding, that, 1. The dress of children ought materially to differ from that of adults: 2. No distinction ought to be made in the dress of either sex during the first years of infancy: and, 3. Let the dress of children be clean and simple, but never too warm. See also SLEEP.

INFECTION, the communication or contraction of some disease, from the effluvia, which arise either from the sick, or from the apartment in which they reside: hence it does not necessarily imply actual contact.

Having already pointed out the proper means of avoiding personal infection, under the article CONTAGION, we shall at present confine our attention to the most efficacious method of preventing the propagation of infectious diseases.

This important object has lately been investigated with equal zeal and success by the patriotic Society for increasing the Comforts, &c. of the Poor; from whose abridged *Account of the Cure and Prevention of Contagious Fevers in the Metropolis*, it appears that not less than *three thousand one hundred and eighty-eight persons have annually died*, upon an average (within the last hundred years) in consequence of infectious fevers.

The alarming increase of this malignant epidemic, is justly attributed to the close and confined dwellings of the poor, where the circulation of fresh air is almost entirely prevented. With a view to check such rapid progress, several benevolent members of the society above mentioned, have formed a well digested plan; in conformity to which, appropriate houses are to be opened, and provided with the requisite medical assistance of every kind, for the reception of such diseased poor as it may be deemed necessary to remove from their own habitations: others, in the mean-time, will receive professional advice at home, and be regularly visited by the physician appointed for that purpose. This laudable establishment is supported by subscription; and we trust, from the known liberality of Britons, that it will never fail for want of effective support.

In places where infection has actually prevailed, the necessary precautions are immediately taken to prevent its return; and the society has, therefore, appropriated a certain sum of money for purifying the tainted habitations of the poor. Their method consists, simply in washing the walls of the room with *hot lime* which will render the place perfectly sweet.

The following rules are to be observed in houses, during the prevalence of contagious fevers: they are extracted from an interesting letter lately published by Dr. HAYGARTH, on the prevention of infectious diseases.

1. As safety from danger depends entirely on cleanliness and fresh air, the door of a sick room, where a person labours under an infectious fever (especially in the habitations of the poor,) ought never to be shut: a window in it should generally be opened during the day, and frequently during the night.

2. The bed-curtains ought never to be closely drawn round the patient; but only on the side next the light, in order to shade the face.

3. Dirty utensils, clothes, &c. ought to be frequently changed, immediately immersed in cold water, and washed clean when taken out.

4. All discharges from the patient should be instantly removed, and the floor near the bed be rubbed every day with a wet mop or cloth.

5. As some parts of the air in a sick room are more infectious than others, both attendants and visitors should avoid the current of the patient's breath, the exhalation ascending from his body, especially if the bed-curtains be closed, and also the vapour arising from all evacuations. When medical or other duties require a visitor or nurse to be in such dangerous situations, Dr. HAYGARTH observes, that infection may be frequently prevented by a temporary suspension of breathing.

6. Visitors ought not to enter infectious chambers, *fasting*; and, in doubtful circumstances, on their departure, it will be advisable to blow from the nose, and spit from the mouth, any infectious poison which may have been inhaled by the breath, and may adhere to those passages.

As these directions are highly important, we trust they will be scrupulously followed, in all cases where any infectious disorders unfortunately prevail.

INFLAMMATION, in medicine, is a tumour attended with unnatural heat, redness, painful tension of the skin, and febrile symptoms, which are more or less violent, according to the nature of the part affected, and the extent of the swelling.

Almost every part of the body is liable to inflammations, but chiefly, the bowels, breast, eyes, &c. of which we shall treat in the progress of this article.

The termination of inflammatory tumours depends on their different degrees of violence, and the causes whence they originate, as well as their treatment. Where they appear in consequence of colds, without any previous disposition of the system, they may often be dispersed by the usual applications; but after fevers, and in persons of gross habits, they generally terminate in suppuration. In aged, infirm or dropsical persons, however, they frequently produce mortification or gangrene.

INFLAMMATION OF THE BLADDER, or *Cystitis*, an affection of that part of the human frame, accompanied with swelling and pain in the lower region of the belly, frequent and difficult discharge, or total suppression of urine, &c.

Inflammations of the bladder arise from calculous concretions; obstructions in the urethra; Spanish flies, either taken internally, or applied to the skin; from wounds, bruises, &c.

In this dangerous malady, it will be advisable to resort immediately to medical assistance: but, if it cannot be easily procured, the patient may apply leeches round the abdomen. Purgatives should likewise be administered; and clysters prepared from a decoction of poppy-heads, may be injected every second or third hour. It will also be beneficial to apply continually fomentations of the same decoction to the lower belly, and to immerse the patient in the tepid bath.

Should the disease, however, terminite by suppuration, and the matter be discharged with the urine, it will be requisite to use the utmost precaution. The patient's diet ought, during the whole progress of the disorder, to consist of the mildest, though nutritive, aliment. He should also avoid every species of food and drink that is stimulant, saline, or acrid; and subsist chiefly on milk, puddings, weak broths, fruits, butter-milk, &c.

INFLAMMATION OF THE BOWELS, or *Enteritis*, an acute, fixed, burning pain in the lower belly, which is attended with a considerable degree of tension in the epigastric region, (see ABDOMEN.) The principal symptoms that characterise this fatal malady, are obstinate costiveness; a hard and small pulse; a painful, and almost continual hiccough, together with fever, and a constant inclination to vomit.

Inflammations of the bowels may arise in consequence of swallowing any acrid substance; from violent passion; drinking large draughts of cold water while the body is overheated; the suppression of any cutaneous eruptions; repulsion of the gout; external injuries; such as wounds, contusions, &c. Persons of a plethoric habit suffer more acutely from this disorder than those of a contrary temperament.

Cure: If the belly be swelled, firm, and painful to the touch, while the pulse is hard and contracted, it will be advisable to take some blood from the arm. A blister should next be employed as speedily as possible, and mild emollient injections of barley water, gruel, &c. administered till stools be obtained: the patient should be placed between blankets, and supplied moderately with diluent liquids, such as barley water, rice gruel, &c. When the violence of the disorder is somewhat abated, opiates may be administered in clysters, which will be of great advantage in mitigating the pain.

As soon as the stomach is able to retain any laxative, the mildest aperients, such as tamarinds with manna, or phosphorated soda, may be taken by the mouth; but, if the disorder tend to a mortification, the treatment before stated should be steadily pursued; and, if gangrene eventually take place, or the disease terminates in suppuration, its course must be left to Nature, the patient being kept as quietly as possible.

During the continuance of this most alarming disorder, the diet ought to be very light; the drinking of all stimulating, fermented, or spiritous liquors carefully avoided; and the mind preserved in a state of tranquillity. See BOWELS.

INFLAMMATION OF THE FEMALE BREAST, is generally occasioned by exposure to cold, repression of the milk, or external violence. It is known by the redness, heat, and pain, either of part or the whole of the breast; and, if the disease be considerable, it is usually preceded by a shivering and accompanied by fever.

Where the inflammation is violent, the usual practice is to take large quantities of blood from the patient; but, in common cases, small local bleedings, by means of a few leeches, are fully sufficient. Considerable benefit will also be derived from the application of emollient poultices, prepared with bread, milk, and cold-drawn linseed oil. The maternal milk may likewise be extracted at intervals, and the breast suspended by means of proper bandages. In some recent cases, a solution of sal ammoniac has been externally applied with success.

If the inflammation continue, it will be requisite to persevere in the use of emollient cataplasms and fomentations; but, as the complaint is of a delicate nature, it will always be advisable to resort to proper medical assistance. See BREAST.

INFLAMMATION OF THE EAR, or *Otitis*, a painful affection of the cavity of the ear, which is sometimes consequent on the MUMPS, but is more frequently occasioned by exposure to the cold. In slight cases, this affection may be removed by dropping a little warm oil of almonds into the ear, and by the application of a common poultice of bread and milk, or of a bag of chamomile flowers; either of which ought to be made sufficiently warm. Should the disorder, however, not yield to these remedies, surgical assistance ought to be procured without delay; lest a suppuration take place, and be attended with total loss of the organ of hearing.

INFLAMMATION OF THE EYE, or *Ophthalmia*, an uncommon redness of, and acute pain in the part affected; an inability to bear the light; and involuntary shedding of tears.

This malady is often occasioned by external injuries, such as blows, burns, bruises, and the like. It also arises from splinters, dust, sand, lime, acrid fluids, or other extraneous substances insinuating themselves under the eyelids; from affections of the teeth; the precipitate healing of old ulcers; long exposure to the night air, and from too much indulgence in stimulating liquors.

Peculiarities. Inflammations of the eye are frequently annual: and instances have occurred, in which they returned at stated periods, and even became chronical; they are farther contagious, and may be caught by mere intuition of the ophthalmia in others.

Method of Cure: When the disease is of a mild nature, it will be useful to cup, or to put leeches to the temple of the eye affected, in a number proportioned to the age and strength of the patient: after the bleeding has ceased, a blister may be applied behind the ear, and brisk purgatives given. To obviate the mischief arising from the use of quack medicines, such as lotions, &c. we shall briefly observe, that there is no better collyrium than simple rose-water, or weak lead-water.

If the means before stated prove ineffectual, and the pain in the inflamed parts rather increase than abate, professional assistance must be speedily procured. Meanwhile, the eye should be carefully secluded from the influence of light, or the patient may confine himself to a dark room, having a temperature neither too cold nor too warm, and cautiously avoid a draught of air. His diet cannot be too mild. Lastly, in this, as well as every other species of inflammation, it is of the utmost importance to abstain from all heating or stimulating aliment and liquors, from all violent efforts both of body and of mind; and to encourage an inclination to sleep.

INFLAMMATORY FEVER, a sudden and acute febrile disease, chiefly prevalent in hot climates. It commences its attack with a considerable degree of shivering, and severe pain in the small part of the back, which are succeeded by an intense heat of the whole body. The eyes are red, and incapable of supporting the light; the patient suffers an insatiable thirst.

The cure of this fever is generally effected by repeated bleedings, proportioned to the patient's strength, and the violence of the disease: antimonial and aperient medicines; the liberal use of vegetable acids; neutral salts; and sudorifics, are given in the various stages, according to the urgency of symptoms. As, however, this fever is attended with great danger, it will always be more prudent and advisable, on its first appearance, to call in medical assistance.

Regimen and Diet: The room of the patient should be kept cool, by a constant succession of fresh air, and somewhat darkened; while every precaution is taken to ensure a state of tranquillity. All animal food, and even broths, must be carefully avoided, as well as aromatic, fermented, and spiritous liquors. The insatiable thirst during the paroxysms of this fever, may be quenched by the free use of barley-water, balm tea, or other mild vegetable infusions, acidulated with the juice of oranges, lemons, currants, and other sub-acid fruits.

Besides the different inflammatory diseases, of which we have briefly treated in the preceding sections, there are various other species of inflammation, denominated from the particular organs or parts affected. Thus, the reader will find some useful hints under the article Brain, and, with respect to the subsequent letters of the alphabet, we refer him to the heads of Kidnies, Liver, Lungs, Mesentery, Pleurisy, Quinsy, Rheumatism, Spleen, Stomach, Tonsils, &c.

Inflammation (*Spontaneous.*) Many substances under certain circumstances, are disposed to spontaneous inflammation, respecting which, it may be useful to caution the reader.

1. Oiled cloth, which had been painted on one side, dried in the sun, and stowed away in a store-house in the town of Brest, inflamed, and destroyed the house.

2. Heaps of linen rags, which are thrown together in paper-manufactories, the preparation of which is hastened by means of fermentation, often take fire, if not carefully attended to.

3. Parched rye bran, wrapped up in a linen cloth, smoked in a few minutes, and in a short time the rag became black; and the bran being hot, fell through it on the ground in little balls. Mr. Tooke, from whom the above fact is taken, accounts for the frequent fires in Russia, from the common practice of binding roasted bran about the necks of cattle, when affected with *thick necks*.

4. Mr. Tooke also mentions, that the hemp magazine at Petersburgh, containing several hundred thousand lbs. of hemp and flax, took fire without any apparent cause; that a roll of cerecloth took fire in a vaulted shop, where neither fire nor candle were allowed; and that a bundle of matting, containing Russian lamp-black prepared from fir-soot, moistened with hemp-oil varnish, caused a fire in a ship's cabin, in the road of Cronstadt. *See the account at length, by* Tooke, *in the Rep. of Arts.*

5. Pieces of woollen cloth unscowcred, heaps of moist woollen yarn, or wool combings, impregnated with rape-oil mixed with butter, which is used in the combing, and packed away in unventilated rooms, have also inflamed.

6. Cotton cloth wetted with drying linseed oil, and confined in a box, began to smoke in three hours; and on the box being opened it immediately inflamed.

7. A quantity of candles had been melted by a tallow-chandler in Philadelphia, and put in a brass sieve to drain, in the evening: in the course of the night they inflamed. A similar accident occurred to the same person from a mass of candle-wick having been thrown into a barrel, after the fat had been melted from the candles.

8. A child at Hartford, Connecticut, having been burnt, was anointed with oil in March, 1803. About three gallons were consumed, and a great part of that quantity was absorbed by the bed. The bed afterwards lay until June, in a garret, when it inflamed.

9. The spontaneous inflammation of stacks of hay is well known to farmers. The method to prevent this accident, is detailed under article Hay.

INGROSSING, is the act of accumulating or buying up corn or other provisions, by wholesale, with a view to sell the same article at a higher price, and thus to oppress as well the poor, as those who cannot conveniently purchase a large stock. This atrocious practice has at all times been subject to severe penalties; and, having already treated of them, under the head of Forestalling, we refer the reader to that article.

INK, a black fluid employed in writing, and usually prepared with an infusion of galls, copperas, and gum arabic.

The chief requisites for the making of good ink, are, 1. Limpidity, so that it may flow freely from the pen. 2. A deep, uniform and black colour. 3. Durability, so that the letters be not liable to be effaced by age; and 4. It should be divested of any corrosive quality, by which the substance of the paper may be destroyed, or the writing rendered in any degree illegible. No ink, however, hitherto used, possesses all these properties; hence several ingenious chemists have been induced to make experiments, in order to render it more perfect.

M. Ribaucourt, in the "*Annales de Chimie,*" directs eight ounces of Aleppo galls, and four ounces of logwood, to be boiled in twelve pounds of water, till the quantity is reduced to one half; when the liquor should be strained through a linen or hair sieve into a proper vessel. Four ounces of sulphate of iron (green vitriol;) three ounces of gum-arabic; one ounce of sulphate of copper (blue vitriol;) and a similar quantity of sugar-candy, are now to be added: the liquid should be frequently shaken, to facilitate the solution of the salts. As soon as these ingredients are perfectly dissolved, the composition is suffered to subside for twenty-four hours: when the ink may be decanted from the gross sediment, and preserved for use in glass or stone bottles, well stopped.

This ink exhibits a purplish black colour in bottles; but the writing performed with it, is said to be of a beautiful black cast, which it retains, unaltered, for a considerable length of time. Each quart of the preparation contains:

	oz.	*drs.*	*grs.*
Of galls	2	5	20
Green vitriol	1	2	40
Logwood	1	2	40
Gum	1	0	0
Blue vitriol	0	2	40
Sugar candy	0	2	40

M. Ribaucourt is of opinion, that ink thus prepared, may be preserved several years in a state of perfection, without depositing either galls or iron.

The ink commonly used, is manufactured by stationers, according to Dr. Lewis's recipe; but it is ill calculated for keeping, as it deposits a black sediment, while the fluid itself is of a pale colour. Each quart of this ink contains:

	oz.	*drs*	*grs.*
Of galls	3	0	0
Green vitriol	1	0	0
Logwood	0	5	24
Gum	1	0	0

Neither blue vitriol nor sugar are employed in this preparation. As, however, both the ink made after the latter method, and that compounded according to other recipes, are not adapted to resist the effects of acids, and are consequently by no means fit for records, deeds, and other documents, M. Westrumb recommends the following ingredients, as being well calculated to remedy this inconvenience. He directs one ounce of Brazil-wood, and a similar quantity of gall-nuts, (Nicholson directs three *oz*) to be boiled in forty-six ounces (somewhat less than three pints) of water, till the whole be reduced to thirty-two ounces, or about two quarts. This decoction is to be poured, while hot, upon half an ounce of copperas, or green vitriol; a quarter of an ounce of gum-arabic, and a similar quantity of white sugar. As soon as a perfect solution of these substances has taken place, one ounce and a quarter of indigo finely pulverised is to be added; together with three quarters of an ounce of the purest lamp-black, previously diluted in one ounce of the best brandy. The whole is to be well incorporated, and, after it has subsided, M. Westrumb asserts that it will form an ink *absolutely indestructible by acids.*

It is essential, that the above ink be well stirred, every time it is used.

A more simple composition, is that proposed by M Bosse, who directs one ounce of Brazil-wood to be boiled in twelve ounces of water with half an ounce of alum, till the liquid be reduced to eight ounces; when one ounce of calcined manganese is to be mixed with half an ounce of gum-arabic, and added to the liquor, which should be previously decanted, in order to render it perfectly limpid. This preparation is said to possess the property of being indelible by the use of any kind of acid, and to be superior to that proposed by M. Westrumb.

A durable ink may also be prepared by washing paper, parchment, &c. with the Prussic acid, which will not in the least injure either of these substances. The materials, thus prepared, may be written on with common ink, and a ground of Prussian blue will be formed beneath every stroke, which will remain long after the black has decayed by the influence of the air, or been destroyed by acids,

The latest, and perhaps most simple, preparation of *black ink*, is that contrived by Van Mons, who observed that sulphate of iron, or green vitriol, when calcined till it became *white*, uniformly afforded a very beautiful black precipitate. According to his experiments, the following ingredients produced an excellent writing ink: four ounces of galls, two ounces and a half of calcined vitriol of iron perfectly white, and two pints of water. The whole was infused in a cold place for twenty-four hours; adding ten drachms of pulverised gum-arabic, and preserving it in a glass bottle, or glazed earthen vessel, slightly covered with paper.

Ink. *By Mr. Brandt, of the Royal Institute.*—Galls bruised 3 oz; green vitriol 1 oz.; logwood shavings 1 oz.; gum-arabic 1 oz.; bruised cloves ½ oz.; vinegar 1 pint: water 1 pint. Set them in a warm place for 10 days, shaking them well. The preceding ingredients are improved by a small stick of Indian ink, and 1 oz. of brown sugar, and 10 grains of corrosive sublimate to a quart of ink.

The best ink is thus made.—To four ounces of good logwood well bruised or rasped, add four quarts, beer measure, of hot-water. If the wood is only coarsely bruised, use 5 oz. and keep the water in scalding heat (not quite boiling) for near an hour. The next day strain off the liquor, add to it while hot, 16 oz. of powdered blue galls, or 20 oz. of galls in sorts. Calcine to whiteness five ounces of green vitriol, and grind it up with half an ounce of blue vitriol, and half an ounce of alum: add these to the logwood liquor: stir them well, then add four ounces of powdered gum-arabic, and three ounces of white sugar. Let all the ingredients be well and frequently shaken together, and kept for a week in a warm place. Pour off the liquor for use, and the remaining ingredients will make another quart of good ink.

To improve the colour and permanence of ink, take some of the above ink, and rub in it some Indian or China ink.

To revive old writings which are almost defaced.—Boil gall-nuts in wine, then steep a sponge into the liquor, and pass it on the lines of the old writing; by this method the letters, which were almost undecypherable, will appear as fresh as if newly done.

To make an indelible Ink.—The bleachers saturate any quantity of dilute nitrous acid with silver, to which solusolution they add an equal quantity of thick gum water, with some lampblack in it. They write on the unbleached linen with this, and *let it dry slowly:* no bleaching destroys it.

For common marking ink, iron may be used instead of silver.

Cotton should always be kept in an inkstand; for the ink in the cotton is kept blacker by the suspension of the colouring part; and if no more ink be present than perfectly to fill the cotton, the pen will always receive a fluid black ink, and may be charged at pleasure by a greater or less gentle pressure, at the time of taking it up, or discharged, by lodging the point for a moment upon the cotton.

Indian Ink, a valuable black for water-colours, imported from China, and other parts of the East-Indies, generally in oblong square cakes, impressed with Chinese characters. The preparation of Indian ink was discovered by Dr. Lewis, according to whom it consists of lampblack and animal glue. In order to imitate it, he directs as much lampblack to be mixed with the glue, as will be sufficient to give it a proper tenacity for making it into cakes. This composition is said fully to answer the different purposes to which the genuine Indian ink is subservient, both with regard to the colour, and the facility with which it may be applied. Dr. Lewis farther found that ivory-black, and other blacks obtained from charcoal finely levigated, may be advantageously substituted for lampblack: ivory and charcoal, however, are generally sold in so gross a state, as to prove gritty when worked, and to separate too speedily from the water.

Ink-powder is prepared chiefly from the acid salt of galls, which may be obtained by the following process: Take two ounces of pulverised galls, and infuse them in twelve ounces of rain or river-water; expose the whole for a few days to a warm temperature, and stir it occasionally: after having extracted the colouring matter, filtre the solution, and suffer it to stand in the open air for several weeks, in a vessel slightly covered. A sediment will then be gradually formed; which, after removing the mouldy skin from the top of the liquor, should be carefully collected. Hot water is next poured on this sediment, when it is again filtred and evaporated to dryness: thus, a grey crystalline salt will be produced, that is the essential basis of black ink; and which may be still more purified by repeated solution, filtration, and evaporation.

If one drachm of this salt of galls be triturated with an equal quantity of the purest vitriol of iron, and about twenty grains of perfectly dry gum-arabic, a composition will be obtained, which, on adding a proportionate quantity of warm water, instantly affords an excellent black ink.

Red Ink. Take a quarter of a pound of the best Brazil wood (get it in the log if possible, and rasp or shave it yourself,) one ounce cream of tartar, and one ounce of alum; boil these ingredients in a quart of clear water, till half is consumed, then add to the ink, when filtred hot, one ounce of gum arabic, and one ounce of fine sugar.

A little salt added will prevent it from growing mouldy.

Blue Ink. One ounce of the finest indigo is first levigated in a glass mortar; then four ounces of the most concentrated vitriolic acid are very gradually poured on the powder; and, on every addition, it is stirred with a glass pestle, so that the whole mixture will require several hours. Such precaution is indispensable, as otherwise the heat generated on adding the vitriolic acid, would impair the brightness of the colour.

After standing from twelve to eighteen hours, in a moderately warm place, this dense mixture must be diluted with water; not by adding this fluid to the composition, but by introducing small portions of the latter into a vessel containing such a quantity of water as may be requisite to produce a lighter or darker shade. In general, from 30 to 40 parts of water will be necessary to reduce it to a fine blue liquid.

This diluted solution of indigo is, however, in too caustic a state to be employed either as a blue dye, or as writing ink. Hence the vitriolic acid ought to be divested of its corrosive quality, by means of such a substance as may form a chemical combination with the acid, and not precipitate the indigo. If the solution be intended merely for colouring or writing on paper, it will be sufficient to add pulverised chalk in small portions, till it cease to effervesce; because a large quantity of this powder, at a time, would cause the liquid to rise above the brim of the vessel. It is easy to ascertain the point of saturation; for, when the powder of chalk scattered on the surface no longer produces any bubbles, the solution should be suffered to stand for 24 hours, then filtred through blotting paper, and preserved in bottles. If, however, this preparation be designed for dyeing silk, such as stockings, &c. it will be preferable to neutralise the vitriolic acid by the addition of aluminous earth, instead of chalk, as the former renders the colour more durable. And, if the solution is to be used for painting on silk, it ought to be previously mixed with gum tragacanth.

Another Blue Ink. Make a solution with one ounce of finely powdered verdigris, and half an ounce of cream of tartar, in three ounces of water. This will make a fine blue writing ink.

GREEN INK. Take a glass retort containing about one quart; pour into it one pint of distilled vinegar; place it over a sand heat, and when it begins to boil, introduce into the liquid small portions of powdered verdigris, till a saturated solution is obtained, or till no more colouring matter can be dissolved. In order to keep the latter suspended, and prevent the formation of crystals, it will be requisite to add about the sixth part of gum arabic, in proportion to the verdigris.

YELLOW INK. One of the readiest ways of preparing it, is by dissolving a small portion of gum arabic and alum in pure water; and infusing in this solution, a little dry saffron. The following, however, is considered as the best mode of producing a fine yellow ink. Boil, slowly, two ounces of French berries, sometimes called Avignon berries, in a quart of water, with half an ounce of alum, till the liquor be a third part evaporated; then dissolving in it two drachms of gum arabic, and one drachm of sugar; add, lastly, one drachm of alum in powder, strain or filtre the mixture, and keep the ink carefully bottled.

To make Indian Ink. Put six lighted wicks into a dish of oil; hang an iron or tin concave cover over it so as to receive all the smoke; when there is a sufficient quantity of soot settled to the cover, then take it off gently with a feather upon a sheet of paper, and mix it up with gum tragacanth to a proper consistence.

N. B. The clearest oil makes the finest soot, consequently the best ink.

PRINTING OR PRINTERS' INK, differs greatly from every other species. It is an oily matter of the consistence of an ointment, the composition of which is, at present, very imperfectly known, excepting to the few who are employed in its manufacture. The following recipe, however, has been found to make printing ink of a tolerable good quality: Let two quarts of linseed oil be boiled in a vessel capable of holding a triple quantity, over a strong fire, till it emit a thick smoke. It is then to be kindled with a piece of paper, and suffered to burn for the space of a minute, when the flames must be extinguished, by closing the vessel. As soon as the oil becomes cool, one pound of black rosin, and one pound of hard soap, cut into thin slices, are to be added; the mixture again placed over the fire; and when the ingredients are perfectly dissolved, a pound of lamp-black, previously sifted, must be incorporated with the mixture; after which the whole is to be finely ground on a marble stone.

This method of making printers' ink is acknowledged to be preferable to the different recipes hitherto published. It is, however, much inferior in beauty of colour to the ink generally used, and is apt to adhere to the types so as to make an indistinct impression. Good printers' ink, which is easily worked, without daubing or tearing the paper, while it imparts a fine colour, is a desideratum that will amply repay the attention and time bestowed upon its preparation. See Printing.

The following recipe was furnished by Dr. Mease, to Dr. Cooper, the present editor of this work:

Into a vessel that will hold about ten gallons, put six gallons of linseed oil, and one pound of litharge; boil, or rather simmer the oil for about sixteen hours. About an hour before you finish, add one pound of hard soap, and one pound of rosin, stir it well at the time, and strain it. Take some of the oil, and grind it very well with lamp-black, burnt in a close vessel, of which the above quantity will take about four pounds. In a large way, it should be made in vessels, of which one close fire-place will heat about five vessels. A wet blanket thrown over the kettle, is the best thing to extinguish it. A vessel proper to boil oil in, will be described under the article Oil.

A good *copper-plate printing ink*, is a great desideratum in the United States.

Sympathetic Ink. Among the amusing experiments of the art of chemistry, the exhibition of sympathetic inks holds a distinguished place. With these the writing is invisible until some re-agent gives it opacity. We shall here mention a few out of a great number, that a slight acquaintance with chemistry may suggest to the student. 1. If a weak infusion of galls be used, the writing will be invisible, till the paper be moistened with a weak solution of sulphate of iron. It then becomes black, because these ingredients form ink. 2. If paper be soaked in a weak infusion of galls, and dried, a pen dipped in the solution of sulphate of iron will write black on that paper, but colourless on any other paper. 3. The diluted solutions of gold, silver or mercury, remain colourless upon the paper, till exposed to the sun's light, which gives a dark colour to the oxides, and renders them visible. 4. Most of the acids or saline solutions being diluted, and used to write with, become visible by heating before the fire, which concentrates them, and assists their action on the paper. 5. Diluted prussiate of potash affords blue letters when wetted with the solution of sulphate of iron. 6. The solution of cobalt in aqua regia when diluted, affords an ink which becomes green when held to the fire; but disappears again when suffered to cool: and, 7. The oxide of cobalt dissolved in acetous acid, and a little nitre added, will exhibit a pale rose colour when heated, which disappears when cold.

Ink stains taken out of Mahogany.—Put a few drops of muriatic acid in a tea spoonful of water, and touch the stain or spot with a feather; and on the ink's disappearing, rub it over with a rag wetted with cold water, or there will be a white mark not easily effaced.

INN, a place appointed for the reception and entertainment of travellers.

INOCULATION, or *budding*, in horticulture, an operation performed on apricots, nectarines, plums, cherries, or other stone-fruit trees, and also upon oranges and jasmines. It is reputed to be superior to every other species of grafting, and is effected in the following manner:

A sharp knife, with a flat handle, must be first procured, in order to raise the bark of the stock for the insertion of the bud. Next, some strong *bass* should be soaked in water, in order to increase its strength, and to render it more pliable. The cuttings being then separated from the trees that are to be propagated, a smooth part of the stock must be selected, about five or six inches above the surface of the soil, if intended for dwarfs; but if designed for standards, they should be budded at least five feet above ground.

An horizontal incision is now to be made across the bark of the stock, from the middle of which a perpendicular slit should be drawn, about two inches in length. The leaf is next cut off the bud, the foot-stalk remaining entire; and a cross cut is made about an inch beneath the eye, after which the bud is to be cut off, with part of the wood adhering to it. The bark of the stock is then to be gently raised with the handle of the knife, and the bud inserted exactly between the rind and the wood of the stock; after which they are bound closely with the *bass*, care being taken to leave the eye of the bud open.

In the course of three weeks, or a month after the inoculation is performed, those buds which have a fresh and flourishing appearance will be joined, when the bandage ought to be removed. In the succeeding month of March, the stock must be cut off in a sloping direction, about three inches above the bud: the shoot proceeding from it should now be fastened to the remainder of the stock for one year, after which the latter ought to be removed by the knife, immediately above the bud.

The proper season for this operation,

is from the middle of June to that of August. The fruit-tree first inoculated, is generally the apricot, and at length the orange-tree, which, however, ought not to be budded till the end of August. For this purpose, cloudy and moist weather is the most propitious; for, if the inoculation be attempted in the middle of the day, the shoots will perspire so rapidly as to leave the buds destitute of moisture.

INOCULATION, in *medicine*, is the transferring of distempers from one subject to another, particularly of the small, and cow-pox.

The practice of inoculation is of great antiquity in the East, whence it was introduced into Britain, early in the 18th century; though not without many struggles, and violent opposition, under the frivolous pretext, that it was contrary to the principles of Christianity, and usurping the sacred prerogatives of the Creator. On account of its superior utility, however, it has at length triumphed, and is now almost generally adopted, excepting among a few fanatics, who, from superstitious motives, confirmed by obstinacy and ignorance, still object to it as an unlawful, and even sacrilegious attempt. The curious reader, who is desirous to become acquainted with these objections, will find them stated, together with a defence of inoculation, in Dr. LETTSOM's *Medical Memoirs*.

Various methods have been adopted, for the artificial communication of the small-pox; the most effectual of which appears to be that of making a puncture in the skin, or removing the epidermis of the upper arm with the point of a lancet, dipt in variolous matter. For the proper treatment of persons during the progress of inoculation, the reader will consult the article SMALL-POX, where the comparative advantages of its recent substitute, the *cow-pox*, will be concisely stated.

INSECTS, in natural history, are so denominated from the greater number of them having a separation in the middle of their bodies, by which they are as it were cut into two parts. The science which treats of them is called ENTOMOLOGY.

Insects have in general six or more *legs*, which are for the most part nearly of equal length and thickness. Sometimes however, as in the mole cricket, the fore-legs are very thick and strong, for burrowing into the ground; sometimes the hind thighs are long and thick, for leaping; or flattened, fringed with hairs, and situated nearly in an horizontal position, to serve as oars for swimming.

Most of the insect tribes are furnished with *wings*. Some, as the beetles, have two membranaceous wings, covered and protected by hard and crustaceous cases, called elytra; some, as the wasps and bees, have four wings without elytra; others, as the common house-flies, have two wings; and others, as the spiders, are entirely destitute of these members.

They are furnished with *antennæ*, which are usually jointed, and moveable organs, formed of a horny substance, and situated on the front and upper part of the head. These serve as instruments of touch, or of some sense which is to us unknown. The *eyes* of insects are formed of a transparent substance so hard as to require no coverings to protect them. Their *mouth* is generally situated somewhat beneath the front part of the head, and in a few of the tribes is below the breast; and the jaws are transverse, and move in lateral directions. This part is furnished with feelers, and other organs, of various arrangement and structure, which constitute the foundation of arrangement in some of the systems of entomology. All insects breathe, not through their mouths, but through pores or holes along the sides of their bodies; or, as in the crabs and lobsters, by means of gills. The skin of insects is in general of hard or bony consistence, divided into plates or joints which admit of some degree of motion, and is generally clad with very short hairs.

Nearly all insects go through certain great *changes* at different periods of their existence. From the egg is hatched the larva, grub, or caterpillar, which is destitute of wings; this afterwards changes to a pupa, or chrysalis, wholly covered with a hard shell or strong skin, from which the perfect or winged insect bursts forth. Spiders, and some other wingless insects, issue from the egg nearly in a perfect state.

LINNÆUS has divided the animals of this class into seven orders, viz.

1. *Coleopterous Insects.*—Have elytra or crustaceous cases covering the wings; and which, when closed, form a longitudinal division along the middle of the back, as in the *chaffer*.

2. *Hemipterous Insects.*—Have four wings, the upper ones partly crustaceous, and partly membranaceous; not divided straight down the middle of the

back, but crossed, or incumbent on each other, as in the *cock-roach.*

3. *Lepidopterous Insects.*—Have four wings covered with fine scales almost like powder, as in the *butterflies* and *moths.*

4. *Neuropterous Insects.*—Have four membranous and semitransparent wings, veined like net-work; and the tail without a sting, as in the *dragon-fly,* and *ephemera.*

5. *Hymenopterous Insects.*—Have four membranaceous and semi-transparent wings veined like net-work; and the tail armed with a sting, as in the *wasp* and *bee.*

6. *Dipterous Insects.*—Have only two wings, as the *common house-flies.*

7. *Apterous Insects.*—Have no wings, as the *spiders.*

Having already stated, under the articles APPLE-TREE, CABBAGE, CORN, CATERPILLAR, FRUIT-TREES, HOT-HOUSE, &c. the most efficacious methods of destroying different kinds of insects, we shall at present communicate such expedients as have not yet been specified, but which deserve to be more generally known.

BLITE-INSECTS, (*aphides,* or plant-lice,) may be destroyed by the smoke of tobacco, or by scattering on them Scotch snuff. Another method is, to place a few of the larvæ of the beetles, called Lady-birds, or Lady-cows, (*Coccinellæ septem-punctatæ,*) on the plants infested with the *blites,* which, it is asserted, will be thus in a short time destroyed. Dr. DARWIN, however, is of opinion, that the most ingenious, as well as the most effectual method of preventing the depreprations of these insects, consists in artificially propagating the larvæ of the aphidivorous fly, which has been observed by naturalists to deposit its eggs where the aphis abounds.

As soon as the larvæ are produced, they devour the aphides around them, seizing the latter in their mouth, and extracting their juices. We have not been able to ascertain their exact duration in a caterpillar state, but believe in about a fortnight they contract, and attach themselves to some solid matter, by means of a little gluten which is discharged from their mouth; and are thus converted into *chrysalis* or *nymphæ.* In this state the insect continues 10 or 11 days, when it bursts its cell, and emerges a perfect fly.

If these insects could be collected, carefully preserved during the winter season, and properly disposed on nectarine and peach-trees, early in the spring, Dr. DARWIN thinks, it is probable that the depredations of the blite might be counteracted, "by the natural means of devouring one insect by another; as the serpent of Moses devoured those of the magicians."

A kind of bellows has been invented by Mr. GREEN, of the Queen's flower-garden, Kew, for the purpose of destroying the red spider, and other noxious insects in hot-houses and pineries, with the fumes of burning tobacco. The same noxious vermin may likewise be exterminated by burning (when the hot-house is shut,) matches moistened with a spiritous tincture of asafœtida, and rolled in a powder consisting of equal parts of sulphur and Scotch snuff. It will also be of service to wash the frames of hot-houses, &c. with four ounces of sublimate, dissolved in two gallons of water; but this operation should be performed with the utmost caution, on account of the corrosive properties of the mercury.

Although insects are very injurious to vegetation, yet Dr. DARWIN is of opinion, that they may be rendered extensively useful as a *manure.* Hence, in the summer months, he recommended heaps of dung to be supplied with water, for promoting the propagation, and nourishment of myriads of vermin; which, when suffered to decay on the soil, would greatly contribute to its fertility.

The catching and preservation of insects, for the collections of naturalists, is indeed a necessary practice, though it has at all times been branded with cruelty. Hence, in stating the most proper methods of effecting this purpose, we shall likewise point out the easiest expedients to deprive them of life.

Beetles, and other insects of the same class, may be caught either with a gauze net, or with a pair of pincers covered with gauze. As soon as they are secured, it will be advisable to immerse them either in hot water, or in spirits of wine, where they will be instantaneously killed: next, they may be fixed to a piece of cork, in a creeping direction, and exposed to the air till all their moisture be evaporated.

Bugs, crickets, and other insects of the hemipterous class, may be put to death in the manner just mentioned, or by pouring a drop of etherial oil of turpentine on their head.

Moths, butterflies, and all other flies which are furnished with membraneous wings, may be taken with gauze nets; then pierced through the shoulders between the fore-wings, with a pin; and after gently squeezing the breast of the insect, it will immediately perish.

Lobsters, scorpions, or such vermin as have no wings, may be preserved in spirits; and the various other kinds of insects, may either be killed with oil of turpentine, or the fumes of sulphur.

After the insects are deprived of all moisture, they should be placed in the boxes or cabinets where they are to remain; these should be kept very dry, and closely shut, to prevent the depredations of small vermin. The bottoms ought likewise, to be covered with pitch and paper on the surface; or, they may be preferably lined with cork, which should previously be impregnated with corrosive sublimate, in a strong solution of sal ammoniac.

Methods of stopping the ravages of the Caterpillars from shrubs, plants, and vegetables.—Take a chafing dish, with lighted charcoal, and place it under the branches of the tree, or bush, whereon are the caterpillars; then throw a little brimstone on the coals. The vapour of the sulphur, which is mortal to these insects, will not only destroy all that are on the tree, but will effectually preven the shrubs from being, that season, infested with them. A pound of sulphur will clear as many trees as grow on several acres.

Another method of driving these insects off fruit-trees, is, to boil together a quantity of rue, wormwood, and common tobacco (of each equal parts) in common water. The liquor should be very strong. Sprinkle this on the leaves and young branches every morning and evening during the time the fruit is ripening.

In the Economical Journal of France the following method of guarding cabbages from the depredations of caterpillars, is stated to be infallible, and may, perhaps, be equally serviceable against those which infest other vegetables. Sow with hemp all the borders of the ground wherein the cabbage is planted, and although the neighbourhood be infested with caterpillars, the space enclosed by the hemp will be perfectly free, and not one of these vermin will approach it. Or, sprinkle flour of sulphur from a linen bag.

To destroy Caterpillars or Flies, hurtful to Turnips.—Take a small branch of elder, put it into a tub of water for two days; then water your bed of turnips with the same, as the vermin begin to appear.

N. B. This will prevent caterpillars, or any insect, from touching cabbages or other vegetables.

To destroy the Gooseberry Caterpillar.—Notice the bushes with care about the beginning of June; and whenever you perceive the appearance of a leaf stripped by the caterpillar, instantly examine the place, with a view to eradicate the disease. You will always perceive that the first appearance of them is towards the bottom of the bush. While they are young they herd very close together, so that at this early period you will frequently find the whole nest upon one leaf; and by picking off that leaf, and crushing the same with your foot, you destroy the whole nest at once. Or sprinkle the trees near the ground with the liquor proceeding from the distillation of coal for gas. It has been successfully tried.

To destroy Ants.—Ants are destroyed by opening the nest, putting in quick lime, and throwing water on it.

To prevent the Smut in Wheat.—The means (to prevent smut) are simple, and no other than immersing the seed in pure water, and repeatedly scouring it therein just before it is sown or dibbled in. Whether well, spring, or river water be used, is indifferent; but repeated stirring and change of water is essential to remove the possible parts of infection that may have imperceptibly adhered to the seed: thus purified, the subsequent crop will be perfect in itself, and seed successively so likewise, if there be no adjacent fields, from whence this contamination may be wafted.

INSOLATION, a term sometimes made use of to denote that exposure to the sun, which is made in order to promote the chemical action of one substance upon another. One of the most striking experiments of this kind is that of the exposure of vegetables, as fresh-gathered cabbage leaves, in a glass jar of water to the rays of the sun, by the action of which a large quantity of pure oxygen gas is obtained.

INSTINCT, denotes that faculty or disposition of mind, by which animals are led spontaneously to perform whatever is necessary to preserve the individual, or to continue the species; independantly of any instruction or experience, and aiming at no determinate object.

Thus, infants suck immediately after

they are born; thus, too, insects deposit their eggs in all climates, invariably in such situations as are peculiarly favourable for the hatching and support of their future progeny.

INSTRUMENTS, Mathematical. A common case of these contains, 1. A pair of plain compasses. 2. A pair of drawing compasses. 3. A drawing pen. 4. A protractor, 5. A parallel ruler. 6. A plain scale. 7. A sector, besides black lead pencils.

INSURANCE, in law and commerce, the act of providing against a possible loss, by entering into contract with one who is willing to give assurance; that is, to bind himself to make good such possible loss, upon the contingency of its occurrence. In this contract, the chances of benefit are equal, to the insurer and the assurer. The first actually pays a certain sum, and the latter undertakes to pay a larger, if an accident should happen. The one, therefore, renders his property secure; the other receives money, with the probability that it is clear gain.

The words insurance and assurance are ordinarily confounded: insomuch that an insurance is said to be a contract, whereby a party engages to pay the loss of another, &c. but, properly, an insurance is not a contract, insurance being the act of the person insuring, and assurance that of him with whom he insures.

The word 'sure,' is a contraction of 'secure.' To make sure, is to make secure. Now, if A wishes to make his property secure, he goes to B, with whom he insures it; that is, he gives a consideration, for which B a-sures it, or makes it secure to him. B is the assurer, a-surer, or maker secure; A, the asurée, a-sured, or made secure; and from these French words, are derived the English ones, assurer and assuree. A now says, that his house is a-sured, and that, with respect to the contingencies of that house, he is a-sured; and why? Because he has insured by contract with B. The insurance, meanwhile, is no contract, because that consisted, not in engaging to do any thing, but in laying down a consideration, for which the engagement, or assurance, was given. A has insured; B, assured.

The common kinds of insurance are:

I. *Against loss at sea:* a most beneficial institution, eminently calculated for promoting the security of trade. It is at present conducted by a regular system of rules, under the immediate sanction of the law, the decisions of courts of justice, and the usage of merchants.

II *Against fire.* This class is divided into three species, namely:

1. *Common insurances:* buildings, the whole external walls of which are of brick or stone, with coverings of slate, tiles, or metals, and in which no hazardous trades are carried on, or hazardous goods are deposited. In this division are also comprised goods which are not hazardous, and which may be kept in such buildings.

2. *Hazardous insurances*, which include buildings covered with slate, tile, or metal, whether built of timber, plaister, timber and plaister, brick and timber; and also buildings, the external walls of which are *not* wholly of brick or stone, and in which no hazardous trades are carried on, or hazardous goods are deposited: and brick or stone buildings with the coverings above mentioned, containing hazardous trades or wares. Also goods, deposited in all timber, plaister, timber and plaister; and brick and timber buildings; hemp, flax, pitch, tar, cotton, turpentine, resin, oil, spirits, and the like, are classed among hazardous insurances, as likewise are the trades or manufactories using the last mentioned articles.

3. *Doubly hazardous insurances:* namely, all the buildings mentioned in the preceding section, however covered, if they be occupied by hazardous trades or goods; and all thatched buildings.

Ships, vessels, barges, and other craft, together with their cargoes; glass, china, earthen-ware, pottery, bottles, bottled liquors in trade, ornaments, shells, fossils, ores, medals, curiosities, oil of vitriol, cork, statuary, and figures in wax, plaister, and marble; are all included in this subdivision: to which may be added, the trades of boat-builders, cart grease-makers, cork-cutters, varnish, flambeau, and lampblack makers, hartshorn and vitriol works, oil, silk, and linen manufactures, and japanners.

Such are the species into which insurances against fire are divided: and that our readers may form some estimate of the expense of insuring goods, &c. against loss or damage by fire, we have subjoined the following brief table, in which the different *annual rates*, payable at the British Fire-office in the Strand, may be seen at one view. Beside these rates, however, there is a duty of three shillings to be paid to government, for every policy of insurance where the sum insured does not amount to 1000*l.*; and of six shillings, if it amount to 1000*l.* or upwards.

		Common.		Hazardous.		Doub. Hazard.		
	L.	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	
Any sum not exceeding	1000	2	0	3	0	5	0	Per cent.
	2000	2	6	4	0	6	0	
	3000	2	6	5	0	7	0	
	5000	3	0	5	0			

When the sum insured is large, a higher premium per cent. is demanded; and money, papers, pictures, gunpowder, and jewels are excluded. If an article be falsely described, in order that it may be insured at a lower premium, the policy is justly void. An insurance made on the same subject at different offices, must be specified by indorsement on the policy; and, in case of loss, the offices pay a sum in proportion; as well as all the expenses incurred in attempting to extinguish fire, or to save goods, even though the endeavours should not be attended with success. And if the value of an article be partially insured, and receive damage by fire, the society is bound to make restitution only to the extent of the sum for which the premium is paid.

III. *For lives*: by virtue of which, on the demise of the party insured, a sum of money becomes due to the person for whose benefit the insurance was made. In this respect also, several societies grant policies of insurance for certain premiums: and, though our limits do not allow us minutely to specify the rules and rates of computation which different associations have adopted, yet we think it will be useful to exhibit a few particulars relative to the premiums paid by persons, who insure either their own lives, or those of others in which they have a certain interest. In the following table we have stated the *rates of insurance on lives* fixed by the *Westminster Society*, which was established in 1792; it is calculated to shew the premiums for insuring one *hundred pounds*, upon the life of a healthy person, from the age of eight to sixty-seven years, within the limits of Europe, but not upon the seas, viz.

Age.	Premium per cent. for one year.			Premium per cent. per annum, for an insurance for 7 years.			Premium per cent. per annum for the whole continuance of life.		
	l.	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*
8 to 14	0	17	9	1	1	5	1	17	7
20	1	7	3	1	9	5	2	3	7
25	1	10	7	1	12	1	2	8	1
30	1	13	3	1	14	11	2	13	4
35	1	16	4	1	18	10	2	19	10
40	2	0	8	2	4	1	3	7	11
45	2	6	8	2	10	10	3	17	11
50	2	15	1	3	0	8	4	10	10
55	3	5	0	3	12	0	5	6	4
60	3	18	1	4	7	1	6	7	4
65	4	15	2	5	10	10	7	16	9
66	5	0	1	5	17	7	8	4	1
67	5	5	6	6	5	2	8	12	1

	l.	*s.*	*d.*
Thus, a life not exceeding the age of 30 years, may be insured for 100*l.* to be paid in case of death within one year, for	1	13	3
Within seven years, by paying annually till the insured shall die, or the seven years be elapsed . . .	1	14	11
Whenever the death shall happen, by paying annually till that event, ...	2	13	4

Another method of insuring for the benefit of survivors, consists in paying an annual premium for a certain sum recoverable *on the death of one person named out of two*; but, as this mode of securing a *competency* is doubtless more objectionable to the party that is obliged to pay the annual premium, than either the preceding *simple*, or subsequent *double* chance of obtaining an equitable reimbursement, we have been induced to subjoin the following table, which exhibits the premium of insurance of one hundred pounds, payable when *either of two persone* shall die within the limits of Europe, but not upon the seas.

Age.	*l.*	*s.*	*d.*	Age.	*l.*	*s.*	*d.*
10	2	17	1	40	5	11	9
15	3	5	0	45	6	7	4
20	3	13	11	50	7	7	8
25	4	0	10	55	8	12	2
30	4	8	11	60	10	4	9
35	4	19	0	67	13	15	8

We have purposely omitted, in this table, the intermediate, as well as the unequal ages of the parties whose lives are *jointly* insured; because the reader will be enabled to form a sufficient idea of the different rates, by comparing the present abstract with that of the preceding calculation. Lastly, the same duties are imposed by government for insurance on lives, as those we have mentioned against losses by fire.

INTEREST is the sum of money paid, or allowed, for the loan or use of some other sum, lent for a certain time, according to a fixed rate. The sum lent is called the *principal*: the sum per cent. agreed on as interest, is called the *rate*, and the principal and interest added together is called the *amount*. Interest is distinguished into *simple* and *compound*.

Interest, *Simple*, is that which is reckoned on the principal only, at a certain rate for a year, and at a proportionately greater or less sum, for a greater or less term: thus, if 5*l.* is the rate of interest of 100*l.* for one year, 10*l.* is the interest for two years, 20*l.* for four years, &c. The rules for finding the interest of money are the following: Multiply the principal by the rate, and divide the product by 100, the quotient in the interest for a year: thus the interest of 300*l.* at 5 per cent, for a year, is $300 \times \frac{5}{100} = \frac{1500}{100} = 15l.$

Multiply the interest for one year by the number of years, and the product is the interest for the same. The interest of 500*l.* for seven years, at 5 per cent. is $25l. \times 7 = 175l.$

The 365th part of the yearly interest is always considered as the proper interest for a day, and its multiples as the interest for any number of days: thus, at 5 per cent., the legal rate, the interest for a day is $\frac{\cdot05}{365} = \cdot0001369$; and the interest for 12 days, at the same rate, is $\cdot0001369 \times 12 = \cdot0016428$. Hence, by means of the following table, all calculations at 5 per cent. simple interest are easily performed, for any number of days.

Days.	Amount.	Days.	Amount.	Days.	Amount.	Days.	Amount.
1	,00013	26	,00356	51	,00698	76	,01041
2	,00027	27	,00369	52	,00712	77	,01054
3	,00041	28	,00383	53	,00726	78	,01068
4	,00054	29	,00397	54	,00739	79	,01082
5	,00068	30	,00410	55	,00753	80	,01095
6	,00082	31	,00424	56	,00767	81	,01109
7	,00095	32	00438	57	,00780	82	,01123
8	,00109	33	,00452	58	,00794	83	,01136
9	,00123	34	,00465	59	,00808	84	,01150
10	,00135	35	,00479	60	,00821	85	,01164
11	,00150	36	,00493	61	,00835	86	,01178
12	,00164	37	,00506	62	,00849	87	,01191
13	,00178	38	,00520	63	,00863	88	,01205
14	,00191	39	,00534	64	,00876	89	,01219
15	,00205	40	,00547	65	,00890	90	,01232
16	,00219	41	,00561	66	,00904	91	,01246
17	,00232	42	,00575	67	,00917	92	,01260
18	,00246	43	,00589	68	,00931	93	,01273
19	,00260	44	,00602	69	,00945	94	,01287
20	,00273	45	,00616	70	,00958	95	,01301
21	,00287	46	,00630	71	,00972	96	,01315
22	,00301	47	,00643	72	,00986	97	,01328
23	,00315	48	,00657	73	,01000	98	,01349
24	,00328	49	,00671	74	,01013	99	,01356
25	,00342	50	,00684	75	,01027	100	,01369

The method of using the foregoing table is this: Multiply the figures corresponding with the number of days, by the sum: thus, if the interest of 75*l.* for 61 days be required: opposite to 61 is the number .00835, which, multiplied by 75, gives .62625 of a pound, which reduced, by multiplying by 20, 12, and 4, gives **12*s.* 6¼*d.***

Interest, *Compound*, or interest upon interest, is that which is paid not only for the use of the money lent, but also for the use of the interest as it becomes due. Almost all questions relating to compound interest may be worked by means of the following tables:

TABLE I.—Shewing the Sum to which 1*l.* Principal will increase at 5 per cent. Compound Interest, in any number of years not exceeding a hundred.

Years	Amount.	Years.	Amount.	Years	Amount.	Years.	Amount.
1	1.05	26	3.555	51	12.040	76	40.774
2	1.102	27	3.733	52	12.642	77	42.813
3	1.157	28	3.920	53	13.274	78	44.953
4	1.215	29	4.116	54	13.938	79	47.201
5	1.276	30	4.321	55	14.635	80	49.561
6	1.340	31	4.538	56	15.367	81	52.039
7	1.407	32	4.764	57	16.135	82	54.641
8	1.477	33	5.003	58	16.942	83	57.373
9	1.551	34	5.253	59	17.789	84	60.242
10	1.628	35	5.516	60	18.679	85	63.254
11	1.710	36	5.791	61	19.613	86	66.417
12	1.795	37	6.081	62	20.593	87	69.737
13	1.885	38	6.385	63	21.623	88	73.224
14	1.979	39	6.704	64	22.704	89	76.886
15	2.078	40	7.039	65	23.839	90	80.730
16	2.182	41	7.391	66	25.031	91	84.766
17	2.292	42	7.761	67	26.283	92	89.005
18	2.406	43	8.149	68	27.597	93	93.455
19	2.526	44	8.557	69	28.977	94	98.128
20	2.623	45	8.985	70	30.426	95	103.034
21	2.785	46	9.434	71	31.947	96	108.186
22	2.925	47	9.905	72	33.545	97	113.565
23	3.071	48	10.401	73	35.222	98	119.275
24	3.225	49	10.921	74	36.983	99	125.239
25	3.386	50	11.467	75	38.832	100	131.501

To find by means of the table what any sum will amount to in a given number of years—Multiply the number in the table, opposite to the term of years, by the sum, and the product will be the answer.

Ex. 1. To what sum will 500*l.* amount in 44 years, at 5 per cent. compound interest?

Opposite to 44 in the table I find 8.557, this I multiply by 500, and the answer is 4278*l.* 11*s.* 6*d.*

To find the number of years in which a given sum will increase to another given sum, in consequence of being improved at Compound Interest. Divide the latter sum by the former, and the sum in the table which is the nearest to the quotient will shew the term required.

Ex. 1. In what time will 200*l.* increase to 1,500*l.* if improved at 5 per cent. compound interest?

$\frac{1500}{200} = 7.5$. The nearest number in the table to 7.5 is 7.391, opposite to which is 41, the number of years. Of course 200*l.* in a little more than 41 years would, by being accumulated at compound interest, at 5 per cent. amount to 1,500*l.*

TABLE II.

Shewing the Sum to which 1*l.* per annum will increase at 5 per cent. Compound Interest, in any number of years not exceeding a hundred.

Years.	Amount.	Years.	Amount	Years.	Amount.	Years.	Amount.
1	1.00	26	51.11	51	220.81	76	795.48
2	2.05	27	54.66	52	232.85	77	836.26
3	3.15	28	58.40	53	245.49	78	879.07
4	4.31	29	62.32	54	258.77	79	924.02
5	5.52	30	66.43	55	272.71	80	971.22
6	6.80	31	70.76	56	287.34	81	1020.79
7	8.14	32	75.29	57	302.71	82	1072.82
8	9.54	33	80.06	58	318.85	83	1127.47
9	11.02	34	85.06	59	335.79	84	1184.84
10	12.57	35	90.32	60	353.58	85	1245.08
11	14.20	36	95.83	61	372.26	86	1308.34
12	15.91	37	101.62	62	391.87	87	1374.75
13	17.71	38	107.70	63	412.46	88	1444.49
14	19.59	39	114.09	64	434.09	89	1517.72
15	21.57	40	120.79	65	456.79	90	1594.60
16	23.65	41	127.83	66	480.63	91	1675.33
17	25.84	42	135.23	67	505.66	92	1760.10
18	28.13	43	142.99	68	531.95	93	1849.10
19	30.53	44	151.14	69	559.55	94	1942.56
20	33.06	45	159.70	70	588.52	95	2040.69
21	35.71	46	168.68	71	618.95	96	2143.72
22	38.50	47	178.11	72	650.90	97	2251.91
23	41.43	48	188.02	73	684.44	98	2365.61
24	44.50	49	198.42	74	719.67	99	2484.78
25	47.72	50	209.34	75	756.63	100	2610.02

I. To find in what time a given annuity will amount to a given sum at compound interest. Divide the given sum by the given annuity, and the number in the table nearest to the quotient will be the answer.

Ex. 1. A person owes 1,000*l.* and resolves to appropriate 20*l.* per annum to be accumulated at 5 per cent. per ann. compound interest, in how many years will the debt be paid?

$\frac{1000}{20} = 50$. The nearest number in the table to 50 is 51.11, and the number answering to this is 26, so that in less than 26 years a debt of 1,000*l.* would be extinguished by laying by, and accumulating at compound interest, annually 20*l.* per ann. If the rate of interest had been 6 per cent. 24 years would have paid the debt, but at 4 per cent. it would have taken between 28 and 29 years.

II. To find how much a given annuity will amount to in a given term, at 5 per cent. compound interest.—

Multiply the given annuity by the number in the table standing opposite to the given term of years.

Ex. 1. I can lay by 50*l* per annum with its interest; that is, I can appropriate 50*l*. a year to be accumulated at 5 per cent. compound interest, how much shall I have saved if I live 21 years?

Opposite to 21 years I find 35.719, which, multiplied by 50, gives 1785.9. Answer, 1785*l*. 18*s*.

III. The present value of an annuity is that sum which, if improved at compound interest, would be sufficient to pay the annuity. For this the following table is adapted:

TABLE III.

Shewing the present Value of an Annuity of 1*l*. for any number of Years not exceeding 100, at 5 per cent. per annum, Compound Interest.

Years.	Value.	Years.	Value.	Years.	Value.	Years.	Value.
1	.952	26	14.375	51	18.338	76	19.509
2	1.859	27	14.643	52	18.418	77	19.532
3	2.723	28	14.898	53	18.493	78	19.555
4	3.545	29	15.141	54	18.565	79	19.576
5	4.329	30	15.372	55	18.633	80	19.596
6	5.075	31	15.592	56	18.698	81	19.615
7	5.786	32	15.802	57	18.760	82	19.633
8	6.463	33	16.002	58	18.819	83	19.651
9	7.107	34	16.192	59	18.875	84	19.668
10	7.721	35	16.374	60	18.929	85	19.683
11	8.306	36	16.546	61	18.980	86	19.698
12	8.863	37	16.711	62	19.028	87	19.713
13	9.393	38	16.867	63	19.075	88	19.726
14	9.898	39	17.017	64	19.119	89	19.739
15	10.379	40	17.159	65	19.161	90	19.752
16	10.837	41	17.294	66	19.201	91	19.764
17	11.274	42	17.423	67	19.239	92	19.775
18	11.689	43	17.545	68	19.275	93	19.785
19	12.085	44	17.662	69	19.309	94	19.796
20	12.462	45	17.774	70	19.342	95	19.805
22	12.821	46	17.880	71	19.573	96	19.815
21	13.163	47	17.981	72	19.403	97	19.823
23	13.488	48	18.077	73	19.432	98	19.832
24	13.798	49	18.168	74	19.459	99	19.840
25	14.093	50	18.255	75	19.484	100	19.847

To find the present value of an annuity for a term of years.—Multiply the number in the table opposite to the given term of years, by the sum, and the product is the answer.

Ex. 1. What is the present value of an annuity of 126*l*. for 21 years.

In the table, opposite to 21 is 12.821; this multiplied by 126, gives 1615.465 = 1615*l*. 9*s*. 3*d*.

INTERFERING, a local disease incident to horses. It arises from various causes; and though this malady is sometimes constitutional in the animal, yet it is more frequently occasioned by an improper method of shoeing; in consequence of which the horse moves his hind feet so closely together, that hard scabs are gradually formed by their continual friction, and the disorder at length is attended with halting or lameness.

Interment. See Burial; and Apparent Death.

Intermittent Fever. See Ague.

INTESTINES, in anatomy, are those hollow membranous tubes of the human body, commonly termed the *guts* or *bowels*, which extend from the right orifice of the stomach to the anus. They are six times longer than the whole body, and by Nature destined to receive the *chyme*, or the aliment, so called after it is converted into a kind of pulp, which they retain for a time; then to mix it with the intestinal juice and bile, to separate and propel the chyle into the milk-vessels, and to eliminate the excrements.

The intestines are extremely irritable. If one of the bowels be slightly cut, the edges of the wound retract equally; and if it be penetrated or cut through, they curl themselves back so as to envelope the upper parts; and the inside is thus completely turned outwards. For an account of the constituent parts and denominations of the intestines, the reader will consult the article ABDOMEN. See also INFLAMMATION of the BOWELS.

INTOXICATION. The state of intoxication greatly resembles that of an incipient palsy or apoplexy. Inebriated persons stagger in all directions; they stammer; every thing appears double; their tongue is in a manner paralytic, and they are deprived of the faculty of speech. This imbecility extends to the mind, which is thus rendered totally incapable of reflection. As the brain is overcharged with blood, the vessels pressing on that part are very liable to burst, from the least accidental concussion; and the unfortunate victim of such folly may expire, while he remains insensible of his danger. Hence he ought to be conveyed into a cool rather than warm room, and placed between blankets, with his head considerably raised; but the legs should be in a pendent situation, and the feet bathed in luke-warm water. Every tight ligature of the shirt, waistband, garter, &c. must be immediately relaxed, and diluent drinks, such as barley or rice-water, plentifully given, though in small portions. Next, a gentle emetic is to be introduced, and the throat stimulated with a feather dipped in oil: after vomiting, the patient generally falls into a profound sleep, from which he awakes weak, trembling, and affected with a violent heart-burn, and acidity of the stomach; especially if wine has been the favourite liquor. To remove the latter complaint, calcined magnesia may be taken with advantage, and afterwards moderate draughts of tea or coffee. Plethoric individuals, however, will better consult their health, by drinking cold water only, which is one of the most salutary restoratives: and during the fit of intoxication, it will sometimes be necessary to open a vein; an expedient which may rescue such persons from the brink of destruction. But, if they have been inebriated by ardent liquors, so that a vapour or smoke proceeds from their mouths, equal quantities of milk and barley-water ought to be instantly poured in; or, where these liquids could not be easily procured, the fresh urine of a healthy subject has been found to afford an excellent substitute. Nor can there be any reasonable objection against this remedy, in cases of a desperate and degrading nature.

[The best remedy for an over-dose of wine, is 3 large teaspoonfuls of magnesia taken in milk, or any other convenient fluid.—T. C.]

JOHN's-WORT, or SAINT JOHN's-WORT. See *Hypericum*.

JOINT, generally speaking, signifies the juncture of two or more things: it is also applied to the human frame, in which case the joints are anatomically called *articulations*.

JOURNAL, or DIARY, properly signifies a day-book, register, or account of particular circumstances occurring daily, and deserving to be noted.

Journals are of extensive utility, in an economical point of view; and we are convinced, that all persons engaged in any active pursuits, especially those of rural and domestic economy, would avoid many inconveniences, by keeping regular accounts. This object, we conceive, might be easily attained, by arranging the pages, ruled with columns, and pointing out the names of workmen, together with the several days of the week, in which the duration and nature of the work done, and the industry or idleness of labourers, might at once be exhibited, by means of simple characters. To these may be added *four* columns, one specifying the rate or price of the labour per day, another containing the number of days, and length of time individuals have respectively worked; a third, for the sum total due to them; and the last for the insertion of occasional remarks.

This plan is well adapted to general purposes; but those who wish to avail themselves of an useful form, solely calculated for agricultural affairs, will find an excellent plan engraven in the 17th vol. of *Annals of Agriculture*.

JOURNAL also denotes a critical account of literary performances. Of this kind we have several monthly publications, which, in general, do strict justice to the works that pass under review. In the present state of society, however, it has often been seriously lamented, that any journal should be made subservient to party principles; especially where religion or politics are concerned. Hence it has frequently been suggested, that, instead of anonymously undermining the reputation of literary works, and injuring literary property, reviewers ought, on such occasions, to affix their signature to every *critique*, and support their strictures by *fair* quotations selected from the book which is submitted to their judgment. Thus, their criticisms would become less *dangerous*, but more *authentic* vehicles of information. The character of a new work would likewise claim greater attention, from those who are in any degree acquainted with the merits of the reviewer: and, though a plan of this nature may probably, at first, meet with many objections, especially by those authors and publishers who are supposed to live upon friendly terms with the dictators of the secret tribunal; yet we hesitate not to say, that many and great advantages would eventually result from this candid and impartial measure. On the other hand, it is maintained, that the *free* republic of letters, by disclosing the names of critics, would be deprived of numerous valuable observations, which are equally pointed and instructive: This powerful objection, however, appears to be inconclusive; because impartial justice is the first maxim of every moral institution. Besides, anonymous writers, when influenced by party-zeal, (as frequently happens), possess an undue advantage over authors who risk their reputation before a discerning public; and, according to general principles of equity, every man has a right to know his enemy, provided he does not conceal himself in an ambuscade.

JOY, one of the most powerful mental emotions, accompanied with an extraordinary degree of pleasure. The effect of this sensation, if not too violent, invigorates the whole animal frame, and facilitates the cure of diseases.

Sudden joy, however, is often as injurious as the operation of either grief or terror; and many instances are recorded, in which the precipitate communication of unexpected news has proved immediately fatal. In order to prevent so dreadful a misfortune, such information ought not to be imparted, till the person to whom it relates, has been cautiously apprised, and thus prepared to undergo the various emotions and sensations that necessarily arise in an organised system. Hence we should fortify the mind equally, for encountering the most agreeable as well as the most disastrous tidings.

IPECACUANHA, a medicinal root imported from the West Indies. There are three kinds distinguished by the eye, namely, the ash-coloured, or grey, brown and white; but the first of these is justly preferred; for it is more efficacious than the white, and less violent in its operation than the brown sort.

The ash-coloured ipecacuanha, as imported from Peru, is a small wrinkled root, bent and contorted into a great variety of figures; its cortical part is compact, brittle, and on breaking, presents a smooth, resinous surface; it has little smell, but a somewhat bitter and sub-acrid taste, so that it covers the tongue with a kind of mucilage.

According to GEOFFROY, NEUMANN, DALE, and Sir HANS SLOANE, the roots of a kind of dog's bane (*apocynum*), are frequently substituted for the genuine ipecacuanha, and have in various instances produced fatal effects. But, if the above-mentioned characters be attended to, accidents of a similar nature may easily be obviated.

Ipecacuanha is one of the safest and mildest emetics, and possesses this peculiar advantage, that it passes off by the skin or bowels, if it should not operate by vomiting. In dysenteries, it is almost a specific, and often contributes to perform a cure in a very few days. When given in powder, its action is more certain than in any other form: hence it is now employed in many diseases, where full vomiting is indicated; for which purpose from 15 to 25 grains are prescribed for a full dose. It is also beneficially administered in very small doses, so as neither to operate by vomiting, purging, nor sweating; for instance, a third or fourth part of a grain, to be taken every half hour or oftener, with a view to vellicate the intestinal canal, and by its nauseating effect, to give a different tone to the action of the stomach and bowels. Thus, it is recommended to be given in the paroxysm of spasmodic asthma, as well as in obstinate coughs; and a dose of three or four grains every morning, in chronical and asthmatic cases.

There are several native plants which, from possessing an emetic quality, are called in the country, *Ipecacuanha*. The chief are, 1. *Euphorbia-Ipecacuanha*, or Spurge. This is very common in many parts of the United States, particularly in the dry and sandy soils of New-Jersey. It flowers early in the spring. The root boiled in water is extremely active, and should only be used in cases where poison has been swallowed. 2. Spiræa, *trifoliata*, or Indian physic, BOWMAN's root, is a common shrub: Its emetic power resides in the bark of the root. It may be safely given in doses of twenty-five or thirty grains; and is a common remedy in the country for the intermittent fever. It is also occasionally given to horses to mend their appetite. 3. *Asarum canadense*, or wild ginger; called colt's-foot in Virginia. This plant has already been noticed under the head ASARABACCA. Both root and leaves are used, but the juice of the latter is commonly given, and is powerful in its operation. 4. *Todophyllum peltatum*. In South Carolina, this plant is called *Hippo*, and according to the information of Mr. WM. BARTRAM, is also a powerful vermifuge. From twenty to sixty grains of the root are given, in proportion to the age of the patient.

IRIS. The root of a white flowered kind of iris, called *Florentine Iris* (*Iris florentina*), which is a native of Italy, and is distinguished by having two flowers on each stalk; the petals bearded, and the leaves sword-shaped.

In a dried state this root is well known on account of its grateful odour, which somewhat approaches that of the violet. It is consequently much used in the manufacture of hair-powder, and other articles for which an agreeable scent is required. It is sometimes employed in medicine as a pectoral or expectorant, and sometimes in dropsies. In a recent state the root is extremely acrid: and, when chewed, excites in the mouth a pungent taste, which continues for several hours; but this acrimony is almost wholly dissipated by drying.

Iris-root is chiefly imported into this country from Leghorn.

The YELLOW WATER-FLAG, or COMMON IRIS (*Iris pseudacorus*) is a very conspicuous plant in most of our marshes. It has sword-shaped leaves, and, about the middle of July bears large and beautiful yellow flowers.

The roots of this plant possess qualities which render them capable of being applied to many useful purposes. Their astringency is such that it is supposed they might be employed with great advantage in the tanning of leather.—In the island of Jura, one of the Hebrides, they are used for dyeing a black colour; and the inhabitants of some parts of Scotland adopt them instead of galls in the making of ink. For this purpose they are cut into thin slices, and boiled, or infused in water, till the liquid is deeply tinged with blue. This is poured clear off, and the blade of a knife, or some other piece of iron, is put into it, and rubbed hard with a rough white pebble; by which, after a little while, the liquor becomes perfectly black.

A slice of the fresh root, if held between the teeth, will, it is said, almost instantly remove the sensibility, and thus alleviate the pain, of tooth-ach; a property which it possesses, in common with that of the Florentine Iris, and some others of its tribe. The leaves of the common iris are considered poisonous to all cattle except sheep.

IRON, in mineralogy, one of the imperfect metals, but the hardest and most useful, as well as the most plentiful. Iron is attracted by the magnet, and is capable of becoming magnetic; but it retains this quality only a short time. Iron unites with carbon; and, according to the proportions, the compound is either BLACK-LEAD or STEEL, which see.

Iron is also sometimes united with sulphur. See SULPHURET, and VITRIOL.

Cast-iron may be called unripe, or raw, iron. It is distinguished by the following properties: it is scarcely malleable at any temperature; it is generally so hard as to resist the file; it can neither be hardened nor softened by ignition and cooling; it is contaminated with various foreign substances, as carbon and silica, the proportions of which vary according to circumstances.

Wrought-iron is produced from cast, by melting; and, if perfectly pure, would be a simple substance, composed of nothing but iron.

While the cast-iron is in a state of fusion, it is constantly stirred by a workman, that every part of it may be equally exposed to the air. In about an hour, the hottest part of the mass begins to heave and swell, and to emit a blue, lambent flame. This continues nearly an hour more; and, by that time, the conversion is completed. The heaving is evidently produced by the action of an elastic fluid, or gas, struggling to escape.

Cast-iron may also be brought into a malleable state, by passing it, while heated, through rollers. This method was discovered by HENRY CORT, of Gosport, who obtained, by letters-patent, the exclusive right of using it. Wrought English iron, wrought in this manner, is said to be equal, and even sometimes superior, to the best Swedish iron; but, CORT's invention apart, the Swedish is considered as the finest sort, and best for working; and the English, as best adapted for bars of stoves, and similar uses; while the Spanish, otherwise equal to Swedish, is found to crack; and the German is too coarse for other than ordinary occasions.

Iron Pavement.—Cast iron blocks have been substituted for kerb and paving-stones at Liverpool, and also at the foot of Westminster bridge, London. In the former place they have failed, at Westminster bridge they have perfectly succeeded.

Iron-moulds, are spots on linen, occasioned by its exposure to damp situations, and also by ink accidentally dropped on the cloth. They may be removed by moistening the stained part, sprinkling it with a small quantity of the essential salt of lemons; (see Lemons.) after which the linen is to be rubbed over a pewter plate, and the blot washed out with warm water. But a less expensive method consists in wetting the spot, applying to it a few drops of spirit of salt, or lemon juice; then rubbing it for a minute or longer between the fingers, while it is carefully held over a hot smoothing-iron, or a basin filled with boiling water, the steam of which greatly facilitates the removal of the stain.

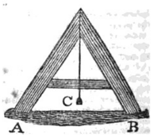
Iron stains on mahogany, are taken out by dilute spirit of salt confined to the spot by wax.

IRRIGATION, signifies the watering, or artificial flooding of land.

The principal objects in irrigating the soil, is a proper supply of water; and, if that fluid abound with mud, the land will be more permanently improved, than by conducting a clear spring over its surface: hence it is certain, that if the liquor collected in farm-yards, the washings of different sinks, ditches, and the drains of the contiguous fields, could be conveyed into the common stream, the water would acquire a more fertilising property.

But, in order to manage this important branch of rural economy with success, it will be requisite previously to ascertain, whether the stream will admit of a temporary wear or dam being constructed across it; whether the water can be raised to such a height as to overflow a particular spot, without injuring the contiguous land; and whether it can be drawn off with the same facility as it is conducted on the soil. If these objects can be attained, the process of irrigation may be undertaken in the following manner:

When the descent cannot be determined with tolerable precision by the eye, an accurate level of the ground must be taken, and the most elevated part compared with the height of the stream to be employed. The instrument used for this purpose, is called a *water level*; and, as the common machines are but imperfectly adapted to the purpose, we have subjoined the following representation of a simple American implement for taking levels.



It consists of two legs of common deal, A and B, about twelve feet in length, which are joined together at the top, and connected below by a cross bar, as above delineated. From the angle at the top, a plummet C, is suspended by a small cord; which, when a mark is made in the middle of the connecting bar, and the two legs are perfectly straight, will strike such mark, so that the level may be easily ascertained.

In the practical use of this instrument, a wooden pin, on which one of the legs of the frame may rest, is to be driven into the ground at the level of the water, where the irrigation is intended to commence. The other leg is then to be brought round, till it touch the ground, on a level with the top of such pin, when another is to be driven in. After the level has in this manner been perfectly adjusted, the last mentioned pin is to be employed as a rest for one foot, and the other turned about, till the level is found in the same manner. Thus, the precise direction which the stream should take will at once be discovered, without any trouble, or incurring any additional expense by digging through the heights or filling up cavities.

The level being taken as directed, a wide ditch is to be cut as near to the dam as possible, that the water may be conveyed to the highest part of the meadow; the sides and banks of the ditch being uniformly kept at an equal height, and elevated about three inches above the surface. Where the meadow is extensive, and the soil uneven, it will be necessary to have three works or dams in different directions, each of which should be five feet in width, if the meadow contain fifteen acres; and the highest part be the most distant from the stream. A ditch, ten feet wide, and three in depth, will, in general, be fully adequate to overflow ten acres of land; and if there be three works or dams in a meadow, and *flood-hatches*, or flood-gates, be placed at the mouth of each, when the water is not sufficient to irrigate the whole soil at once, it may be performed at three different periods; by taking out one of the hatches or gates for the space of ten days, at the expiration of which it is to be let down, and the other two taken up alternately for a similar period: thus each division will receive a proper share of water in its turn, and derive from it equal benefit.

Where the fall of the meadow renders it practicable, the bottom of the first work should be made as deep as the bed of the river; because the water in proportion to its depth, will carry a larger or smaller quantity of mud with it, and consequently fertilise the soil in a more or less effectual manner. Small ditches, or troughs, ought likewise to be cut from the works at right angles, about 12 yards apart from each other, and their breadth should be adequate to the distance to which the water is to be conveyed: thus a trough two feet in width, and one foot deep, will irrigate a surface twelve yards wide, and forty feet in length.

It will, however, be requisite to provide the ditches with occasional flood-gates or sluices, especially when the water is rapid, in order to keep it sufficiently high to flow through the perforations in the gates, or over the sides. Between every second trough, a drain is to be cut at equal distances in a parallel direction, and of a proper depth for receiving all the water which overflows the adjacent lands, and conducting it to the principal drain with such rapidity, as to keep the whole stream in constant motion. For, if it be suffered to stagnate, it will be productive of the worst consequences; as the turf would become rotten, the soil be soaked without being ameliorated, and the land produce only coarse grass, rushes, or other aquatic weeds.

Where the meadows are cold, flat, and swampy, the width of the bed, that is, of the intermediate space between the trough and drain, ought never to exceed six yards. In such cases, the land cannot be too much intersected, especially when there is an abundant supply of water. The fall of the bed in every meadow ought to be in the proportion of one inch to each foot; for a rapid current always contributes to produce fine and sweet herbage; but the water ought never to flow more than two inches, nor less than one inch deep, except during the summer months.

Such is the method of irrigation practised in Gloucestershire, and likewise, with very few variations, in the counties of Wilts, Dorset, Cambridge, Hants, &c Its advantages, indeed, are so important that, we trust, no rational agriculturist will hesitate to adopt the practice of floating land throughout Britain, in every situation where a command of water can be obtained. Common meadows are not only enriched, but those of a swampy nature are consolidated by means of the mud conveyed on them. They are also protected from the effects of frost by the flowing water, or by the ice when it is frozen; hence the roots of grass remain unaffected by the cold, and excellent crops are thus produced so early, as to be of infinite service for spring food, before the natural grass appears.

By irrigation, good pasturage may be procured in the beginning of March; and, if the season be mild, much earlier. This crop is particularly excellent for feeding such cattle as have been *hardly* wintered; and so great are the benefits attending the flooding of lands, that the farmers of Gloucestershire are enabled to commence the making of cheese, at least *one month* earlier than those who do not possess the same opportunity. The utility of watering land is still farther evinced by this circumstance, that from the great forwardness of grass, the feeding between the months of March and May is worth one guinea per acre; in June one acre will yield two tons of hay; and the *after-grass* may always be estimated at twenty shillings, whether the summer be wet or dry.

Land may be floated at any period of the year. In the months of December and January, the chief care consists in keeping the soil sheltered by the water from the severity of frosty nights. It will, however, be necessary to expose the surface to the air every ten days, or fortnight, during the winter, by laying it as dry as possible for a few days; and to discontinue the flooding, whenever the land is covered with a sheet of ice.

In February, greater attention is required; for, if the water be suffered to flow over the meadow for several days in succession, a white scum will be generated which is very pernicious to the grass; and, if the water be drawn off, and the land exposed to a severe frosty night, without being previously dried for a whole day, the greater part of the tender plants will be totally destroyed.

In the beginning of March, the grass on well flooded meadows will, in general, be so forward as to furnish abundant pasturage; when the water should be drained for the space of a week, that the soil may become firm, before heavy cattle be allowed to graze on such land: these, however, if the season be cold, ought to be supplied with a little hay every night, during the first week.

In the month of April, the grass may be eaten down closely; but no cattle should be turned in later; as otherwise the crop of hay will be much impaired; the grass become soft or woolly; and consequently its value be considerably diminished.

In the beginning of May, the water is again thrown over the soil for a few days, in order to moisten it; but the practice ought on no account to be continued during the summer; for it has an unfavourable effect on the *aftermath;* and produces in sheep fed on it, the disorder called the *rot*

Many other advantages arise from irrigation; but, as our limits admit only of giving an outline, we refer those readers who are desirous to acquire farther information relative to this interesting branch of rural economy, to Mr G. BOSWELL's *Treatise on Watering Meadows*, &c. 1780, in which the necessary implements, and terms employed in irrigation, are explained and illustrated with engravings; as likewise to Mr WRIGHT's *Art of Floating Land*, &c. 1799, where the subject is perspicuously treated, and objections are ably answered.

The advantages of irrigation are well understood by the farmers of Pennsylvania, and carefully practised by all who have water at command. Contrivances are in some instances also made for this invaluable purpose, which are highly ingenious, and deserve to be generally followed. The one by Mr. WITMER, on the Lancaster road, near Conestoga creek, shall be particularly described under the article WATER.

Dr. W. speaks of the irrigation of England, but all the attempts of that country, are the mill-dams of school-boys, when compared with the great, the *noble executions* of the inhabitants of France and Spain. ARTHUR YOUNG speaks in high terms of the prodigious exertions of the inhabitants of Languedoc and Provence, to irrigate their lands. In Spain, the *Noriae*, or walled-mounds to hold water, excite the astonishment of the traveller; and such a quantity do some of them hold, that serious consequences sometimes attend a breach. The city of Larca, in the province of Murcia in Spain, was inundated by the quantity of water reserved in a *Noria*, upon a neighbouring mountain. SEMONDE, in his excellent account of the agriculture of Tuscany, (*Geneva*, 1801,) also details the exertions of the farmers and gardeners of the fertile *Val de Nievole*, in irrigation, which are worthy of attention. Col. TATHAM's work, entitled "*National Irrigation*," (London, 1801,) has fully and ably treated the subject, and detailed the various modes pursued in England, America, and Spain, and gives some plates, which may be usefully consulted.

IRRITABILITY, denotes that essential property of animals, in consequence of which their muscular fibres, on being touched, contract or become short, in a greater or less degree.

Of Plants. A long continued, unusual, or unnatural stimulation of vegetable fibres, by an increase of heat, exhausts the spirit of vegetation: hence a slighter degree of cold will destroy such fibres; because, after having been excited for a considerable time by a more powerful stimulus, they will cease to act on the application of one that is weaker, so that in consequence of hot days, tender plants are more liable to perish from the coldness of the night. For this reason, gardeners in the more northern climates, shelter both the flowers of apricots, and the tender vegetables, during the spring frosts, from the meridian sun, as well as from the destructive cold of the night, which is generally the most intense about one hour before sun-rise.

In the hot days of the month of June, 1798, Dr. DARWIN twice observed several rows of garden-beans to become quite sickly; and some of them even died in consequence of being irrigated for one or two hours with water from an adjoining canal. This circumstance he attributes to the sudden application of cold, after the plants had been greatly enfeebled, and deprived of their irritability by the excessive heat of the season, rather than to the too copious watering of the dry soil Some vegetables, however, such as strawberries, onions, &c. which were equally exhausted, are less liable to be thus injured, and even receive benefit from occasional irrigation in dry and sultry weather.

On the contrary, the spirit of vegetation acquires additional vigour, if plants have been exposed for a considerable time to a less than usual degree of heat; but, if they be suddenly removed from a cold to a warm place, they will experience a similar fate with those hapless persons, to whose frozen limbs sudden heat was imprudently applied: thus, too great increase of action occasions inflammation, which is generally succeeded by mortification and death. This fact has been ascertained and confirmed by the experiments of M VAN USLAR, who kept two species of the spurge, or wartwort, namely, the *Euphorbia Peplus*, and *Esula*, L. secluded from the light and heat, with a view to render them more irritable: on exposing these plants afterwards to a meridian sun they became gangrenous, and in a short time decayed.

The increased, or diminished, degree of irritability in plants, is by Dr. DARWIN attributed to their previous habits, with respect to the stimulus of greater or less heat. Thus, the periods at which vegetables thrive in the spring, appear to be greatly influenced by their acquired habits, as well as by their present sensibility to heat: hence potatoes will germinate in a much cooler temperature during the spring, than in autumn; hence also, the vernal months are the most favourable to the process of making good malt; because the barley will then sprout with a less degree of heat than at any other season.

The irritability of plants has been discovered to be greater in the morning than at noon, and less in the evening than at mid-day: though it is considerably augmented during cool and rainy weather. In a similar manner, the limbs of animals acquire a greater sensibility of heat, after having been exposed to the cold: thus, the hands, after immersing them for a short time in snow, glow with warmth on entering the house; and the late celebrated SPALLANZANI observed several animals and insects, that conceal themselves under ground in a torpid state during the winter, and enjoy the genial warmth of the spring, again to disappear at a season when the heat of the atmosphere was much higher than on their first emerging from their subterraneous abode.

From these considerations, Dr. DARWIN infers, that such plants as are sheltered in a warm room, during the winter, ought to be occasionally exposed to a cooler atmosphere, in order to increase their irritability; otherwise their growth in the succeeding spring will be much retarded. For the same reason, the continual vicissitudes of the air and weather are essentially necessary to mankind; as the frequent changes of heat and cold have an obvious tendency to preserve or restore their irritability, and consequently the activity of the system. Hence not only the health and energy of men are more conspicuous in our variable climate, but their longevity is comparatively greater than on those tropical continents, which experience both a more considerable degree of heat, and a more steady atmosphere.

ISCHURY. See URINE.

ISINGLASS, or *Ichthyocolla*, a preparation from different species of a Russian fish, called sturgeon, of which we have given some account in the article CAVIAR It may also be produced from the air-bladders of the cod, or *gadus*, as well as from those of other fish inhabiting fresh waters.

The method of making isinglass was for ages kept a secret with the Russians, but has lately been discovered. We extract the following process from the 63d vol. of the *Philosophical Transactions:* First, the sinewy parts of the fish are boiled in water, till they are dissolved; then the viscid liquor is strained, and suffered to cool. When cold, the fat is carefully taken off, the liquor again boiled to a due consistence, then cut in pieces and rolled into a semi-circular twist, in which state they are suspended on a string, till carefully dried.

The sounds or air-bladders of fresh-water fish, in general, are the most transparent, flexible, and delicate substances, and consequently furnish the finest isinglass. But the intestines and *peritoneum* of the fish constitute inferior sorts of this article, denominated *book*, and ordinary *staple*. The *belugas*, being the largest and most plentiful fish in the Russian rivers, yield the greatest quantity of this animal glue, which, on account of its strength, is preferred to all other kinds.

Isinglass is most successfully prepared in the summer; as frost changes its colour, deprives it of weight, and impairs its gelatinous principle: but the forms into which it is twisted by the Russians are useless, and frequently injurious to its native qualities. These peculiar shapes were probably adopted with a view to conceal the real substance, and thus to preserve the monopoly.

The Newfoundland and Iceland fishermen split open the fish, as soon as they are taken, and throw the back bones, with the sounds annexed, into a heap; but, before putrefaction commences, the sounds are cut out, washed and salted for use. In performing this operation, the best, namely, the intercostal parts, are left behind—the Iceland fishermen are so sensible of this circumstance, that they beat the bone upon a block with a thick stick, till the *pockets* come out easily, so that they preserve the sound entire. This isinglass is dried upon nets in the open air, and resolves into fining like that of Russian manufacture, in sub-acid liquors, such as stale beer, cyder, old hock, &c. while, in equal quantities, it produces similar effects upon turbid liquors, except that it falls sooner and closer to the bottom of the vessel; though foreign isinglass, on account of the greater tenacity of its native mucilage, retains the power of fining preferably in warm weather.

With respect to the very extensive use that is made of isinglass by brewers, and wine-merchants, we have already expressed our disapprobation, under the head of CLARIFICATION, and also recommended proper substitutes, especially as H. JACKSON informs us, in his *Essays on British Isinglass*, published about the year 1765, that its yearly consumption in the brewery was *then* calculated at 25 tons weight, and that 40,000*l.* annually are paid for this article to the Russians. Hence it is sincerely to be wished, that this importation may be entirely superseded.

This wish may be well applied to the United States, as our rivers abound with sturgeon, and the use of isinglass is yearly increasing.

The finest and most transparent sorts of isinglass are consumed in making mock-pearls, and in stiffening linens, silks, gauzes. &c. It may likewise be reduced to a jelly, as it dissolves in alkaline liquors; and even cold lime-water converts it into a pulpy mass. Although such preparation would be extremely detrimental to health in fining liquors, yet it may be usefully employed for another purpose; because, on mixing this jelly with compositions of plaster, lime, &c. for ornamenting walls exposed to vicissitudes of weather, it forms a firm and durable cement; and, if worked up with common mortar, it soon acquires the hardness of bricks. With this intention, however, it is more conveniently prepared by dissolving it in cold water, acidulated with oil of vitriol: thus, the acid quits the jelly, and forms with the lime a *selenitic* mass; while the jelly, being deprived of part of its moisture, speedily dries, and hardens into a firm body; whence its superior strength and durability may be easily explained.

In a medicinal view, isinglass is but seldom employed; though it may with advantage be used in violent bleedings from the nose, by introducing into the nostril a pessary made of soft linen, and dipped in a solution of this glue, prepared in equal parts of spirit of wine and water. Isinglass also forms a principal ingredient in *sticking plaster*; and, when boiled in fresh milk to the consistence of a strong jelly, it affords a very nourishing food to invalids; though it should be eaten with precaution by those who possess a weak stomach, or digest slowly; as it has a great tendency to turn rancid and putrid.

ISSUES, are small artificial apertures or ulcers in the muscular parts of the body, for the purpose of draining superfluous moisture, or of giving vent to some noxious humours.

Issues are usually made in the arms, legs, or back, either by caustics, or by incision. They are chiefly applied in disorders of the head, eyes, ears, teeth, &c. which are thus relieved, and frequently cured. Inveterate complaints generally require two or more issues to produce any considerable effect, namely, one in each arm, or on the arm and leg of one side of the body.

Artificial ulcers have been much recommended to the consumptive and asthmatic, though we doubt their efficacy when the patient's strength is already exhausted. They have, nevertheless, often been found useful in cases of confirmed melancholy, when placed near the spine, as the unhappy victim of that disorder can seldom be induced to take any internal remedies. The discharge from these orifices may be promoted by the application of issue pease, and by dressing them with mild blistering ointment.

In order to close an issue, it is sufficient to discontinue the pea; but in case any proud flesh should arise, it may be removed by strewing on it finely powdered loaf-sugar, or burnt alum: after which the wound will speedily heal, if it be properly dressed.

ITCH, a cutaneous affection, in which the skin is covered with small watery pustules, that appear first on the wrist, or between the fingers, then upon the arms, legs, &c. where they are accompanied with an intolerable irritating sensation.

The itch is contagious, but seldom prevails where due attention is paid to cleanliness, fresh air, and wholesome food. Unless it be improperly treated, it is in itself not a dangerous disease: but if it be too long neglected, the whole humours become corrupted; and if it be suddenly suppressed, without proper evacuations, it is apt to occasion fevers, inflammations, pulmonary consumptions, &c. Hence the extreme absurdity of having recourse to ointments which profess to cure it in a certain number of days, or even hours: such imposition should be punished by the magistrate.

When the patient is of a gross habit of body, it will be necessary first to administer one or two brisk laxatives, before he can with safety resort to the tepid bath. The parts affected may next be rubbed alternately, every second day, one half of the body, with an ointment consisting of two ounces of flour of sulphur; two drachms of crude sal ammoniac, finely pulverised; and four ounces of hog's-lard, or fresh butter. To this composition may occasionally be added a small portion of the essence of lemons, by which the disagreeable smell of the sulphur will be greatly suppressed.

During this treatment, the patient ought to keep the body gently open, by taking every morning and evening from ten to fifteen grains of the flour of sulphur in honey, treacle, or new milk. The same clothes ought to be worn in the whole course of the disorder, excepting the linen; and, when a cure is effected, the former should by no means be touched, till they have been properly fumigated with sulphur, as otherwise the contagion will again be communicated.

There is another species, called the *dry*, or *malignant itch*, which generally arises from the scurvy, and is very difficult to eradicate. In this case, the liberal use of antiscorbutics, and a vegetable diet, are of equal importance. A strong decoction of tobacco has often been found an efficacious external application. Mercurial ointments have likewise been employed with advantage, but their use requires great circumspection, as it is absolutely necessary to keep the bowels regular, by taking the mildest laxatives, and to guard against cold or catarrhs.

A remedy for this loathsome affection was discovered by M GRILLE. He had observed that persons employed in the manganese-mines, of Macon, in France, were not liable to this cutaneous disease; and that the neighbouring workmen, when attacked by the itch, were accustomed to resort to these mines, with a view to be cured of their complaint: thus, the tormenting irritation speedily ceased; the eruption disappeared; and the skin became perfectly sound.

Hence, M. GRILLE was led to conjecture, that *manganese* might be employed as a remedy for the itch. He therefore formed 6 parts of this semi-metal in a pulverised state, and 16 parts of fresh hog's-lard, into an unguent: several persons troubled with this disease were directed to rub such ointment over their bodies; at the same time, the usual medicines for opening the bowels, were administered; and the malady was, in a few days, completely removed.

ITCH, a distemper in *cattle*, which is either occasioned by foul litter, and inattention to the skin of these useful animals, or is communicated from others; though it sometimes arises from a disordered state of the body, Prof. BRADLEY directs the infected creature to be well washed with its own urine previously warmed, and mixed with stale salt butter.

JUICE, denotes the sap of vegetables, or the fluids of animals. See BLOOD, PLANTS, SAP, &c.

The juices of several plants and fruits are expressed with a view to obtain their essential salts, and for various medicinal purposes: they are used either without further preparation, or converted into syrups and extracts. Such juices are generally obtained by simply bruising the plant in a marble mortar, and then submitting the pulp to a press: some vegetables, however, require the addition of water in the mortar, to express their juice with greater facility. The sap of most antiscorbutic plants, abounding with saline volatile principles, may be disposed to filtration, merely by pouring it in close bottles, and immersing them in boiling water: thus, the saline and volatile particles, in which their medicinal virtues chiefly consist, may be easily preserved. See FILTRATION.

Fermentation is another method of clarifying juices that are susceptible of it; for all liquors which have undergone that process, spontaneously become pellucid. See FERMENTATION.

Most vegetable juices coagulate, when exposed to the air, whether they are extracted from the plant by wounds, or flow from it without any external injury: in the latter case, however, it is generally the effect of a disease in the plant, either from a species of canker, or some other internal cause.

Different parts of the same plant often yield juices of opposite qualities. Thus, the sap in the root of the cow-parsnip is of a yellow colour; while that obtained from its stalk is white. The wild or strong scented lettuce, affords the greatest abundance of milky juice, of any known British plant. On wounding the stalk with a knife, there exudes a white ropy liquor; but, if an incision be made at the top of the stalks, a purple-tinged sap appears, as if cream had been sprinkled over it with a few drops of red wine. In a short time, it acquires a deeper purple, and thickens so, that finally a separation takes place, when the watery part floats on the surface. See LETTUCE.

JULEP, a convenient form of medicines, which require no decoction, and are mixed up with syrup or sugar, in order to dilute them properly, or to cover their pungency.

Acid julep consists of 3 drachms of weak vitriolic acid, 3 ounces of simple syrup, and two pounds of spring-water. These ingredients are to be gradually mixed, and the whole carefully strained. See VITRIOLIC acid.

Amber julep: Let two drachms of tincture of amber, and half an ounce of refined sugar, be mixed with 6 ounces of spring-water, and strained in the manner above-mentioned. Under this form, the tincture of amber is rendered an agreeable medicine, which may be substituted for the amber itself, in nervous affections, &c. for which it is sometimes prescribed.

Æther julep is composed of two scruples of pure vitriolic æther, 6 oz. of spring water, and half an oz. of refined sugar, which ingredients are to be mixed and strained. In spasmodic affections, this preparation is often given with advantage, in repeated draughts of about half a tea-cupful every hour, or oftener.

Saline julep, is a mixture of three drachms of purified pot-ash and half a pound of water; to which are to be added, one ounce of the syrup of black currants, and half a pound of lemon-juice; or such a quantity of the latter as will be sufficient to saturate the alkali. This compound is often used in febrile diseases, by taking two or three table-spoonfuls every hour, in order to promote a slight perspiration. It also increases the secretion of urine, and is frequently employed to restrain vomiting.

JUNIPER-TREE, or *Juniperus*, L. a native shrub, comprising several species; of which the principal is the *Juniperus communis*, or COMMON JUNIPER-TREE: it grows in many parts of Britain, upon dry, barren commons; on hills, or in vallies, in open sandy plains, or in moist and close woods, where it generally continues a low shrub: but, if planted in a good soil, it will attain the height of 15 or 16 feet, and produce numerous branches.

The juniper-tree may be propagated by the berries, if they can be procured in a ripe state. It is remarkable, that no grass will grow beneath this shrub; though the latter is said to be destroyed by the meadow-oat.

Juniper-berries possess a strong, not unpleasant smell; and a warm, pungent, sweet taste; which, on chewing, or previously well bruising them, is succeeded by a bitterish flavour. They require two years before they ripen, and yield, on expression, a rich, sweet, aromatic juice, bearing some resemblance to the taste of honey. These berries are useful carminatives; for which purposes a spirituous water, and an essential oil, are prepared from them. The Swedes eat them for breakfast, in the form of a conserve. In Germany, they are frequently used as a culinary spice, and especially for imparting their flavour to *sauer-kraut*. The spirit impregnated with the essential oil of this fruit, is known by the name of GIN, to which we refer.

The wood of the juniper-tree is of a reddish colour, very hard and durable: it is employed in marquetry and veneering; making cups, cabinets, &c. while the bark may be manufactured into ropes. The charcoal made from this wood, affords the most durable heat, so that live embers are said to have been found in the ashes, after having been covered for twelve months. The resin of this plant (gum Sandarach), when powdered and rubbed into paper, is frequently used under the name of *pounce*. Thrushes and grouse feed on the juniper-berries, and disseminate the seed in their dung. The sprouts are eaten by horses, sheep, and goats.

IVORY, the tooth or tusk of an elephant, growing on each side of his trunk, and somewhat resembling the shape of a horn.

Nearly 1000 fossil elephant tusks per annum, are dug up in Siberia, and used for ivory.

Ivory is much esteemed for its remarkable whiteness, its polish and beautiful grain. Dioscorides asserts, that if this substance be boiled with the root of mandragoras, for six hours, it may be rendered soft and flexible. By steeping small pieces of ivory in vinegar, or any other acid, they become ductile, and may be preserved in that state for a considerable time, by keeping them in common water. This hard substance may also be softened and whitened, by immersing it in a hot decoction made of red sage leaves, in double-distilled white wine vinegar, with the addition of a little quick-lime. For removing spots, the ivory should be laid in unslacked lime, and a small portion of water poured on it, lest the heat be too intense, and the ivory scale, or become brittle. Others discharge the stains by merely steeping it for some time in strong lime-water.

Ivory may be dyed *green*, either in a solution of copper or verdigris in aqua-fortis; or by grinding together two parts of verdigris and one of sal ammoniac, and dissolving them in strong white-wine vinegar. Farther, by employing four ounces of aqua regia, and one ounce of sal ammoniac, a fine *purple* colour will be the result.

A *black* colour is given by a solution of brass in aqua-fortis and logwood.

A *red* colour by Brazil-wood and lime-water.

Ivory, bone, horn, and other solid parts of animals, may be stained *yellow*, by previously boiling them in a solution of one pound of alum in two quarts of water; then immersing them for half an hour in a liquor prepared by boiling half a pound of turmeric in a gallon of water, till it be reduced to three quarts, and afterwards plunging the coloured substance into alum-water. All bony matters may also be stained *blue*: they are first to be tinged with green, then dipped in a strong and hot solution of pearl-ashes. See also Bones, Tortoise-shell, and Wood.

Ivory may be prepared as a ground for miniature-painting, by cleansing the leaves or plates, and rubbing them over with the juice of garlic. This method is preferably recommended for removing its greasy quality, which prevents the colours from fixing on the ground, and is said to be more useful than either soap or ox-gall.

With respect to the medicinal properties of ivory, its shavings, like those of Hartshorn, may, by boiling, be converted into a jelly, and possess similar restorative virtues.

Ivory-black. Ivory burnt in close vessels.

IVY, the Common, or *Hedera Helix*, L. a native plant growing in woods, hedges, and about old buildings: it flowers in the month of October.

This plant was first brought to Europe from Canada, and has been long cultivated in the British gardens, chiefly for the purpose of covering walls or buildings. It shoots almost 20 feet in one year, and gradually extends to the top of the highest building. It is easily propagated in autumn, by its trailing branches; and will thrive in almost any soil or situation; so that in the following October it is fit to be transplanted to those places where it is destined to remain.

The leaves of ivy possess a nauseous taste, though in Germany they are employed as a specific in the atrophy of children. Among the lower class of people in England, they are applied to issues; and the Scotch Highlanders prepare an ointment from the leaves, which is much esteemed for the cure of burns. The berries are of a fine gold colour, and possess a slight degree of acidity: when swallowed by children or adults, they occasion vomiting, diarrhœa, and profuse sweating. The roots of this plant are employed by leather-cutters to whet their knives. Boehmer informs us, that both the leaves and branches are useful in tanning. Apricots and peaches, when covered with ivy during the month of February, have been observed to bear abundant fruit. Horses and sheep eat the common ivy, but it is totally refused by cows and goats.

K.

K, the eleventh letter of the alphabet, and what is called a double consonant. It has the hard sound of *c* before *e* and *i*, where, according to the English analogy, *c* would be soft, as in the words *kept* and *king:* it is seldom at the end of words except in monosyllables, as *clock*, *back*, &c. It is generally omitted, where it was formerly used, as in *music*, *public*, &c. It is also used between a vowel and the silent *e* final, as *cloke*, *broke*, &c. *k* is silent before *n*: it is borrowed from the Greek *kappa*, and was but little used among the Latins, perhaps never but in words borrowed from the Greek language. As a numeral K was put for 250, and with a stroke at the top K stood for 250,000.

KALE the Sea, or *Crambe*, L. a genus of perennial plants comprising three species, one of which is a native of Britain, namely, the *Maratima*, Cliff-kale, Sea-cabbage, or Sea Colewort. It grows on sandy soils, near the sea-coast, and flowers in the months of May and June. This plant is relished by horses, cows, goats, hogs, and sheep. Its young and tender leaves are boiled and eaten as cabbage; but, when full grown, they frequently occasion giddiness.

The sea-kale is cultivated in many gardens as an esculent vegetable It is also reared in pleasure-grounds, as a flowering perennial; because the stalks divide into fine branching heads of flowers. For either purpose, it is propagated by seeds, sown in autumn or spring in any common light soil, in which the plants are intended to remain. At the end of two years, they will produce shoots fit for use, and multiply exceedingly by the roots, which continue for many seasons.

KALEIDOSCOPE. We select a brief but ample account of this instrument, invented by the celebrated Dr. BREWSTER, of Edinburgh, who is well known to have been long engaged in investigating the physical properties of light. This instrument is constructed according to the laws of reflected light, in such a manner as to amuse by an ever-varying succession of splendid tints and symmetrical forms, and enables the observer to copy such of them as may appear most appropriate for any of the numerous branches of the ornamental arts; and we shall no doubt soon have china, paper, carpets, floor-cloths, &c. decorated with patterns derived from it. Its construction is extremely simple, and depends for its effect upon two reflecting surfaces meeting each other at almost any angle, but more properly at one which makes a twelfth, tenth, eighth, or some other aliquot part of a circle.

The following directions will enable such of our readers as may choose to amuse themselves by making one, to do so without difficulty, although it must be understood, that no person has a right to make one for sale, without the authority of the patentee.—Procure a circular tin tube, 8 inches long and 2½ wide; close it at the bottom with a circular piece of *ground* glass; half an inch above this let another circular piece of *plane* glass be firmly fixed, having first put into the space between them some fragments of differently coloured glass, beads, bugles, bits of lace, and indeed any small transparent objects. Now construct a hollow prism with two strips of glass 7½ inches long and 1⅓ wide, making the third side of the prism with a strip of blackened pasteboard of the same length, and about 1¼ wide, which when put between the strips of glass, will make the angle formed by the edges of them about 45 degrees. On the *outside* of this prism black paper must be pasted, which will serve to keep it together, and make the inner surfaces of the glass reflectors. If looking glass could be procured to cut the strips from, it would be better on account of its reflecting more light, and consequently affording a brighter image. The prism being formed, it is to be set upright in the tube upon the uppermost circular glass, and maintained in that position by paper stuffed between its sides and the side of the tube: lastly, put a top which has a small round hole in its centre, on the tube, and the instrument is complete. This hole may be stopped by a piece of plane glass, or by a lens, but the latter requires to have its focus adjusted to the reflecting surfaces, which will give much additional trouble without any material advantage.

By looking attentively through the prism, a circle of brilliant light will be seen, divided into as many sections as the number of times that the angle of the reflectors is contained in 360: thus, if it be 45 degrees, there will be 8 compartments and 8 reflections of any object that may be presented at the angle; but as the alternate reflections coalesce, the image will have but *four* branches from the centre. If the angle at which the reflectors are set be 30 degrees, there will be 12 compartments in the luminous circle, with as many reflections, and six branches from the centre. But as some light is lost by every reflection, it is not desirable to multiply them beyond 12, if so far, for then the last reflections become so faint as to render the image formed by them very indistinct. The degree of brightness of the images then determines the order in which they have been formed, and an attentive observer will readily recognise that order.—If, instead of allowing the reflectors to meet, they only incline towards each other, they give a curved image, and if they are kept parallel to each other, they show one of a rectilinear form. If the object presented at the angle be put in motion, the combination of images will likewise be put in motion, and new forms, perfectly different, but equally symmetrical, will successively present themselves, sometimes vanishing in the centre, sometimes emerging from it, and sometimes playing around it in double and opposite oscillations. When the object is tinged with different colours, the most beautiful tints are developed in succession, and the whole figure delights the eye by the perfection of its forms and the brilliancy of its colouring.

By making the circular compartment of the tube which contains the objects forming the figures, to turn with the hand, instead of turning the whole tube, a greater degree of steadiness is obtained, and the motions of the person using the instrument are less inconvenient.

[The principle of this instrument in its common or simplest form, is the formation of a series of images disposed in the circumference of a circle by the multiplied reflections of a set of objects from two plane mirrors inclined at some certain angle. It is evident, that in order to obtain a regular appearance throughout the field of view, this angle must be an equal division of the circumference; otherwise a broken portion of a sector of the circle will present itself at the opposite part of the field of vision, from that which the objects themselves occupy. It is not quite so obvious, however, that this angle must not merely be an aliquot part of the circumference, but it must also divide the semicircle equally. If this latter condition be not observed, portions of the images at the extreme parts or edges will not coalesce, but will overlap and confuse each other. This will happen when the angle is 120°, 72°, 40°, &c. which are the third, fifth, and ninth parts of the whole circumference; and in all cases when the divisions of the circle form an odd number; but never when they form an even number, as six. This condition also results from the mathematical formula for calculating the number of images of an object situated between two plane mirrors inclined to each other at a given angle. See Wood's Elements of Optics, prop. 14. For further observations on polygonal Kaleidoscopes, see Thomson's Annals of Philosophy, for May, 1818, p. 376. The paper that envelopes the glass reflectors may be of any dark colour, or rather black. The term Kaleidoscope is derived from *καλος* beautiful, *ειδος* figure.—T C]

KALENDAR, a table of the distribution of time, otherwise called, from the Arabic, an *almanac*. An almanac, indeed, though for no etymological reason, is understood to contain more than a *kalendar*; the latter being simply chronological, while to the former is added various useful tables. Almanac strictly means a diary; but, according to its miscellaneous composition, it is rather a manual.

There is nothing of mystery, or of extraordinary difficulty, in the construction of a kalendar, tables of the celestial motions being at hand. The operations are these: 1. The computation of the sun's and moon's places, for each day of the year; a labour that may be avoided by taking them from an ephemeris; 2. The finding the dominical letter, and, by its means, distributing the days into weeks; 3. The computation of Easter; and fixing, thence, the moveable feasts; 4. The addition of the immoveable feasts, with the names of the martyrs; 5. The addition of the sun's and moon's places, as before found, with the rising and setting of each luminary, the length of the day and night, the twilight, and the aspects of the planets; 6. The addition of the chief phases of the moon, and the sun's entrance into the cardinal points, that is, the solstices and equinoxes; together with the rising and setting, especially heliacal, of the planets and principal fixed stars.

There are various systems of chronological computation, according to the different forms of the year, and the division of time adopted in particular countries; such as the Julian, Gregorian, and the late French kalendar.

The *Julian* kalendar received its name from Julius Cæsar, the reformer of the old Roman kalendar, and is divided into periods comprising four years; the first three of which are called *common*, and consist of 365 days; the fourth has received the appellation of *bissextile*, or leap-year, and contains 366 days, on account of the six hours, which in the space of four years form a day, within a few minutes, and thus, in the course of 134 years, render it necessary to subtract an intercalary day.

For this reason, Pope Gregory XIII, with the advice of able mathematicians, appointed that the hundredth year of each century should have no bissextile, excepting in every fourth century, on account of the deficiency of eleven minutes in the six hours of which a bissextile consists.

This reformation, or the *new style*, as it is now termed, commenced on the 4th of October, 1582, when ten days were omitted in the old kalendar; but that change was not introduced into Britain till it was enacted by the 24th Geo. II. c. 23, that the Gregorian computation should be adopted; and it accordingly took place in the year 1752.

KALMIA, a genus of native plants, of which there are certainly four species, viz. 1. *K. latifolia*, or broad-leaved laurel, winter green, calico-tree. This is the largest of all the species, growing to the height of seven or eight feet, and sometimes higher. The wood is hard, compact, and is employed, by turners and joiners, in making work requiring such wood. It also furnishes handles for scythes. The leaves are highly poisonous to horses, but deer, and the pheasant eat them with impunity. They, however, when eaten late in the winter by pheasants, once communicated a quality to the flesh of these birds, which occasioned alarming symptoms, in many persons, and the death of others who eat of them, during the latter end of the winter of 1790-91. An account of the fact, as recorded by Dr Mease, may be found in the *New-York Med. Repository*, vol. 1.

2. *K. angustifolia*, narrow-leaved, or dwarf laurel—grows on sandy heaths, and dry, poor soils. Bees collect a deleterious honey from the flowers of both species of this plant, which produces very disagreeable symptoms in those who eat of it; as mentioned under article Bee.

An ingenious experimental inaugural dissertation was published in Philadelphia in 1802, by Dr Thomas, upon the above species of Kalmia; from which it appears that the leaves of both abound with resin, but that the last is the most active of the two. From the same dissertation we find, that a decoction of the *K. latifolia*, prepared by putting one ounce of the leaves in eight ounces of water, and boiling it down to four ounces, cured a *diarrhœa* of eight weeks continuance. The dose at first was thirty drops six times a day, but producing vertigo, it was diminished to four times a day. The itch was speedily cured by washing the parts with the decoction.

The Scald head, *Tinea Capitis*, was also cured by anointing the head with an ointment made of the leaves and hog's fat. Dr. Barton bears testimony of the efficacy of this ointment in the Tinea. See "*Collections for a Materia Medica.*"

3. *K Glauca* of Aiton.

4 *K. Hirsuta* of Walter, or *K. ciliata* of Bartram. The last is a native of the Southern states.

KAOLIN. Decomposed felspar used in the potteries.

KELP, a term used to denote a species of pot-ash, employed in glass manufactories for chrystallising the *metal.*

Kelp consists of the calcined ashes of the sea-wrack and other plants growing on the sea-shores, between high and low water mark. The preparation of this useful article should be commenced in the spring; for, if the burning be delayed till the harvest is far advanced, the rainy season of autumn renders the process more tedious and difficult. To prepare the materials for producing *kelp*, the sea-weeds should be cut with hooks or sickles; but the aspect of the shore, together with the time and rapidity of the tides, should be previously ascertained. If the coast be level, the plants may be speedily conveyed by horses and carts to the place where they are to be dried and burnt. On the contrary, when the shore is rugged, a strong rope should be laid at low water, around the cut grass; and, in order to increase the diameter of this rope, the longest sea-plants ought to be twisted round it. With the returning tide, the whole spot thus surrounded will soon be set afloat, and the cut vegetables may be readily collected; for, as the water advances, they may be gradually dragged towards the shore, by means of the rope serving as a net. To facilitate their removal, one end of the cord should be drawn through a ring, applied to the other end, and tightened so as to contract the plants into a small bulk: thus, they may be easily moved along with the tide. After the herbage has reached the place of its destination, it must be dried in a manner similar to hay; coiled and stacked up for burning; proper care being taken to form the stacks, so as effectually to secure it from the rain.

An artificial kelp is made by decomposing Glauber's salt, by means of lime, old iron, and charcoal. The following is a good account of kelp:

A hollow is dug in the ground, three or four feet wide; round its margin are laid a row of stones, on which the sea-weed is placed: this is set on fire, and continually replenished; and from the centre, where a perpetual flame is kept up, a liquid, like melted metal, drops into the hollow beneath. When the hollow is full, as it commonly is after a day's burning, all heterogeneous matters are removed, and the kelp, wrought with an iron rake, brought into a uniform consistence, while in a state of fusion. When cool, it consolidates into a heavy, dark-coloured, alkaline substance. This substance is the kelp of the glass-houses; where its use is similar to that of kali, polverine, potash, and pearl-ash.

KENNEL, or Channel, generally signifies a small cavity or hollow for conducting water through the streets; but, in its present sense, it is peculiarly applied to denote a house or building for the reception of a pack of hounds.

A kennel ought to be situated on an eminence, in a dry situation, and in the vicinity of a brook or running stream. The strictest cleanliness is necessary, both for promoting the health of hounds, and also to preserve their sense sufficiently acute: for this purpose, kennels should be well aired, and strewed with fresh straw, to prevent the mange, or other infectious distemper. Mr. Beckford recommends these buildings to be erected in the vicinity of the mansion; and, on their first establishment, to construct them of the requisite capacity: because every subsequent addition impairs their external appearance. Those readers who wish to acquire farther information on the management of the kennel, will meet with amusement in Mr. B.'s *Thoughts on Hunting*; of which, we understand, a new edition will shortly appear.

KERMES, in zoölogy, an insect constituting a species of the insect coccus, found in the excrescences of a species of oak-tree.

Kermes, in pharmacy, and dyeing, a kind of oak-gall, produced on an evergreen species of oak. See Oak-*gall*. The kermes resembles a berry. It is of a bright red colour, and full of juice of the same. It is found adhering to the stem and branches of a scarlet-oak, a native of Spain, of Languedoc, and of other hot climates. It is of a vinous smell, and a bitter, though agreeable taste; and its pulp is full of minute eggs of insects. If the berries remain till it be dry, these eggs are hatched; but to prevent this destruction of the dye they are steeped in vinegar.

KERMES-MINERAL, one of the best preparations of antimony, which is so termed from its close resemblance to the insect called Kermes, or *Coccus ilicis*, L. It is prepared by boiling together half a pound of crude antimony reduced to powder, and two pounds of purified pot-ash in eight pints of pure water, for fifteen minutes; stirring the mixture with an iron spatula; and then expeditiously filtring it while it is hot. The liquor is now suffered to stand in a cool place, where it soon deposits a powder that ought to be repeatedly washed, first with cold, and afterwards with hot water, till it be completely divested of its taste.

This medicine was originally contrived by Glauber, whose successor sold the secret of preparing it to the French

King; in consequence of which, it was published in 1720. If judiciously administered, kermes-mineral is a compound of great efficacy, on account of its exciting and evacuating properties. According to the quantity that is taken, it will operate either as an emetic, purgative, sudorific, or expectorant; for it is equally attenuating and resolvent, especially in disorders of the breast, proceeding from obstructions. The particular doses of this powder are mentioned in the accounts of the different disorders in which it is recommended; but, in general, *one grain* only is prescribed for adults, to be taken every third or fourth hour.

KEY, a well known instrument employed for opening Locks, of which we shall give some account under that article.

Key also denotes an extensive wharf for the conveniance of loading and unloading goods on board of merchantmen. See Quay.

KIDNEY-VETCH, *Anthyllis*, L. an indigenous biennial plant, comprising several species, of which the *vulneraria*, or Lady's-finger, is the principal: it grows in meadows and pastures, in a chalky or calcareous soil; produces yellow flowers from May to August, and its seeds ripen in October.

In the cultivation of this vegetable, no particular care is necessary, farther than to keep it clean from weeds. It affords excellent pasturage for sheep. Linnæus remarks that, when the kidney-vetch grows on a reddish clay soil, the blossoms present a red colour: but, in white clay-land, they are uniformly white. Although these flowers were formerly celebrated as vulnerary, yet we believe they might be more usefully employed as a dyeing material, and perhaps, as a substitute for *indigo*; because, in a dry state, they acquire a *blue* colour. Country people obtain from them a fine yellow dye. The plant is is relished by cows and goats.

KIDNIES, in anatomy, are those two viscera which separate the urine of animals. They are situated in the lower part of the cavity of the abdomen, on each side of the vertebræ of the loins, between the last false rib and the hip-bones. The right kidney lies beneath the great lobe of the liver; and the left, under the spleen: they are generally about five inches in length, three inches broad, and one inch and a half thick, in adults. Their excretory ducts are called *ureters*, or canals which convey the urine into the bladder.

The kidnies of animals are, in general, tough, acrid, and difficult of digestion: hence they ought not to be eaten by persons of a delicate habit, or of a sedentary life. Those of calves, lambs, and other young animals, may however be used with safety; as they afford a more palatable and congenial food.

Inflammation of the *Kidnies*, or *Nephritis*, a painful affection of these parts, attended with a frequent discharge of water, which is either thin and colourless, or very red; with vomiting, coldness of the extremities, difficulty of breathing, numbness of the thigh, and other febrile symptoms.

The remote causes of this inflammatory disease are, stony concretions, external contusions, violent or long continued riding, strong diuretic medicines, such as the spirit of turpentine, &c. The more immediate causes, are the same as induce other local inflammations.

Cure. In this, as in similar complaints, bleeding is the first remedy to be resorted to. It will also be advisable to apply cloths immersed in hot water and wrung out, as nearly to the part affected as the patient can bear, and to renew them as often as they grow cool. Emollient clysters are also to be frequently administered; and the same treatment must be adopted, as has been already pointed out under the article Inflammation.

Should these remedies fail to afford relief, and the numbness of the part affected, together with the other symptoms, continue to increase, a suppuration will immediately ensue. In this disease, the patient must avoid all acrid, sour, and salted provisions, and subsist entirely on mild, mucilaginous vegetables. They must likewise not attempt to lie on feather-beds, or be covered too warm; never sleep on their back; and carefully take daily, though moderate, exercise.

KILDERKIN, a liquid measure, consisting of two firkins; and two kilderkins make a barrel. See Firkin.

KILLOGRAMME, in the new metrical system of France, ten *grammes*, or the weight of one-tenth of a cubit *mètre* of distilled water, weighed *in vacuo*, when at its greatest density, which is in the temperature of 39° of Farenheit's thermometer.

KILN, a stove used in various manufactures. It also denotes a building for the admission of heat, in order to dry or burn certain materials deposited in such an edifice. See Brick, Malt, and Lime.

In 1796, a patent was granted to Mr. J. Pepper, of Newcastle under-Line, for his invention of a kiln, for the purpose of drying malt or other grain. As, however, the ingenious inventor's plan would be understood only by architects, or builders, the curious reader will resort to the 5th vol. of the *Repertory of Arts*, &c. where it is illustrated with two engravings

KING-FISHER, or *Alcedo*, L. a genus of birds frequenting every quarter of the world, and comprising numerous species; the principal of which is the *ispida*, or common king-fisher.

This bird is about the size of a swallow; of a clumsy shape; and the bill disproportionately long. But the great beauty and variety of its plumage amply atone for its inelegant form. The crown of its head, and the coverts of its wings, are of a deep blackish green, spotted with a bright azure tint; the back and tail exhibit the most resplendent shades: the whole interior side of the body is of an orange cast; and the tail, consisting of twelve feathers, presents a rich deep blue. When flying, in a bright day, the plumage of this bird exhibits a variety of the most dazzling colours.

The female king-fisher constructs her nest in holes scooped out of the sides of cliffs, to the depth of three feet; and deposits from five to nine eggs, of a semi-transparent white. She begins to lay early in the season, and excludes her first brood about the month of April; as the period of incubation does not exceed twenty days. While she is brooding, the male plentifully supplies her with fish; and, unlike most other birds, the female in that season is muscular and plump.

King-fishers are the most rapacious little animals that skim the deep; and, though of diminutive size, they devour almost incredible numbers of fish. Hence, their flesh is unfit to be eaten; but their beautiful plumage retains its lustre longer than that of any other bird.

KINO, a gummy resinous substance, exuding from incisions made in a tree called *Pau de Sangue*, a native of the inland parts of Africa, but of which there is no botanical account.

From its sensible qualities, and also by its striking a black colour with a solution of green vitriol, this drug is remarkably astringent. It was first recommended by Dr. Fothergill, and is now often prescribed in diarrhœas, fluxes, &c. It affords an extract both in spirits and in water, but is more generally given in the form of a tincture, from one to two tea-spoonfuls, three or four times in 24 hours.

KITCHEN, an apartment or room destined for the dressing of provisions, and preparing them for the table.

The very great improvements lately made by our countryman Count Rumford, in the *Science of Cooking;* deserve a particular notice in an American edition of a work, expressly compiled for the purpose of increasing our knowledge of domestic economy. Hence the editor has been at the pains to condense the most important matter on the subject, which is diffused through two thick octavo volumes; and also introduce cuts of some of the kitchen utensils, which from the simplicity of their construction, are most liable to meet with approbation in the United States.

Some general observations shall first be made.

1. Count Rumford has fully shewn, that, *water just on the point of boiling, is as hot as it can possibly be made in an open vessel;* that consequently all the fuel used in making it boil with violence, is wasted, without adding a single degree to the heat of the water, or expediting the process of cooking a single instant; and that it is by *heat*, its *intensity*, and *duration*, that the food is cooked, and not by the boiling.

(An attention to the regularity of heat is of great consequence, not only in cooking, but also in various arts requiring much heat. The success of many processes depends upon it.)

2. Food, long and violently boiled, is rendered much less savoury, in consequence of the finer and more volatile parts being carried off in the steam rising therefrom, and is also less nourishing.

3. 26½ lbs. of dry pine wood are required to heat 300 lbs. of water, and 100 lbs. of beef, (both at the temperature of 55,) boiling hot, and 3 lbs. more of wood to keep the whole boiling three hours: in all, equal to three fourths of a peck of pit coal.

Count Rumford objects, 1st. to the kitchen ranges of England, (and he might include with great propriety *our wood-devouring wide-throated chimnies.*) 2. To the iron ovens, and boilers heated by lateral flues, and 3. To smoke-jacks:

both of which are creeping into use here, just as they are exploded in England!

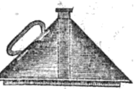
He prefers common jacks, as being less troublesome, less expensive, and not so liable to get out of order, or to make the kitchen smoke, and lays down the following objects to be had in view, in *attempting to improve kitchen fire-places.*

1. In general, the boiler, kettle, and stew-pan, should have its separate closed fire-place; its separate grate, on which the fuel must be placed; and separate ash pit, closed by a well fitted door; furnished with a register in the middle of this door, for regulating the admission of air; and a separate canal with a damper, for carrying the smoke into the chimney. The canal may open into the chimney about a foot above the level of the mantle.

2. In the fire-places for all boilers and stew-pans, which are more than eight or ten inches in diameter; or which are too large to be easily removed with their contents, *with one hand*; an horizontal opening, just above the level of the grate, must be made, for introducing the fuel into the fire-place: which opening must be nicely closed by a fit stopper, or by a double door. In the fire-places for small stew-pans, this opening may be omitted, and the fuel may be introduced through the same opening, into which the stew-pan is fitted.

3. All portable boilers and stew-pans, should be *circular*, and be suspended by their circular rims. Fixed boilers should be an *oblong square*, to permit the free repairs of flues; and *all* boilers rather *broad* and *shallow*, than narrow and deep.

4. All boilers should have covers, made of tinned iron, of the form of a hollow cone, as in the annexed cut.



The height of the cone to be one-third its diameter; and the bottom closed by a circular plate, or thin sheet of tinned iron; and fitted to the top of the boiler; which is to be completely closed by means of a rim, about two inches wide, and made to enter the boiler, and soldered to the flat sheet of tinned iron, which formed the bottom of the cover. The steam to be carried off by a tube one-half inch in diameter, passing through the cover, and projecting one-half inch above the top, and soldered above and below, in such a manner, that the air in the cone may remain completely confined.

The same fire-place may serve occasionally for several boilers or stew-pans. But those used in the same closed fire-place, must be of the same diameter, and of different depths: and have their diameters marked on their handles or brims, or covers; these fire-places also should be marked with the same number: and to guard against mistakes respecting the sizes of utensils, and the fire-places to which they belong: the difference of the diameters of two boilers or stew-pans should never be less than *one whole inch.*

In some they have been made of 6, 8, 10, 12 and 14 inches in diameter; and one-third, one-half, and two-thirds their diameters in depth.

The boilers should be placed near the chimney, and in general, in one range, or rather in one mass of brick work. The distance of fitting up or setting boilers and sauce-pans, may be taken at a width of a brick or 4½ inches; and the same space allowed for the distance of the side of the boiler, from the out-side or fronts of the mass of the brick work.

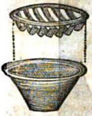
The readiest way of proceeding in making a plan of the kitchen machinery, is, to form it on the plan of the room; and having settled the places of the boilers, to trace on this plan, a ground plan of the whole; and a sufficient number of sections and elevations should be drawn to shew the situations, forms and dimensions of the fire-places, and of all the other parts of the apparatus.

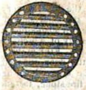
The ash pits are first to be sunk, the ash doors placed, and the foundations of the brick work laid.

The separate closed fire-places under iron ovens or roasters, must be made very small, otherwise the cook will make the fire too large: and it is a great fault to overload the fire-place with fuel, especially when the fire is first kindled. The fire-place must be situated directly under the oven or boiler.

The fuel should be burnt upon a grate in the form of a segment of a hollow sphere, or of a dish, that the solid pieces of the inflamed fuel may fall together in the centre of the fire-place, without any assistance. As to the size of the grate, make its diameter equal to half the diameter of the boiler at the brim.

See the following figures.

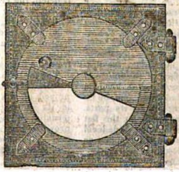




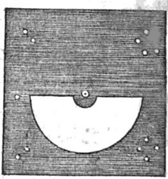
When wood is used, it must be cut into lengths of six inches.

When the fire-place is closed on all sides by a wall, and when the opening by which the fuel is introduced, is kept closed; no air can press in laterally upon the fire; but yet, when the grate is larger than the heap of burning fuel, which must often be the case, a great quantity of air may insinuate itself by the sides of the grate into the fire-place, without going through the fire: but when, instead of an iron grate, a perforated hollow earthen pan is used, by making the bottom of the pan, two, three, or four inches, and making all the air holes point to one common centre, (to the focus or centre of the fire) this *furtive* entrance of cold air into the fire-place, will, in a great measure, be prevented. These holes ought to be smaller above than below, to prevent their being choked. This evil may be also prevented, when circular hollow iron grates are used; by *narrowing the fire-place immediately under the grate*, in the form of an inverted, truncated hollow cone, the opening or diameter of which, above, being equal to the internal diameter of the circular rim of the grate, and that below (by which the air rises to enter the fire-place) about *one-third* of that diameter. See the first cut on this page. This opening below, through which the air rises, must be immediately under the centre of the grate, and as near to it as possible: care must be taken, however, that a small space be left between the outside or underside of the iron bars which form the hollow grate, and the inside surface of this inverted hollow cone, in order that the ashes may slide down in the ash pit. These directions are more peculiarly applicable to fire-places of a moderate size.

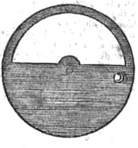
The construction of the ash pit door with its register, may be understood from the following figures.



The above is a front view of the door with its register. The whole is constructed of sheet-iron, except the narrow pieces at the four corners, which hold down in its place the circular plate of the register, and the small circular plate (as large as an half crown) in the centre of the register, which are made of brass, on account of that metal not being so liable to rust as iron.



The above cut represents the plate of sheet-iron, which forms the front of the door, with the holes in it, by which the other parts of the machinery are fixed to it.

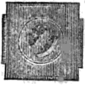


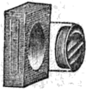
The above represents the circular plate which forms the register: to this plate is fixed a projecting knob, or button, by which it is turned about.

In constructing these register doors, and in general, all iron doors for fire-places, the flat surface of the inside of the door should merely shut down on the front edge of the door frame, or lie against it, touching in all its parts. This edge, by grinding it on the flat surface of a stone, should be made level to receive it: doors fitted in rabbits or grooves, are troublesome.

When the heat is very intense, the frame of the door should be made of fire-stone, (or soap-stone cut edgewise, the necessity of which was stated under article FIRE-PLACE.) And that part of the door exposed to the fire, should be covered, either with a fit piece of fire-stone, fastened to it with clamps of iron; or a sufficient number of strong nails, with long necks and flat heads; or of staples, being driven into that side of the plate of iron which forms the door exposed: that side of it should be covered with a body about two inches thick, of strong clay mixed with a due portion of coarse powder of pounded crucibles; which mass will be held in its place by the heads of the nails, and by the projecting staples. This mass being put on wet, and gently dried, the cracks being carefully filled up as they appear, and the whole well beaten together into a solid mass, will, when properly burned on by the heat of the fire, form a covering, which will effectually defend it from all injury from the fire: and be very lasting.

The contrivance for closing the doors for the introduction of fuel, most approved of, is a tile with a conical hole in its centre, 6 inches in diameter externally, and 5¼ inches diameter within, provided with a fit baked earthen stopper. The annexed cuts will give an idea of their forms.





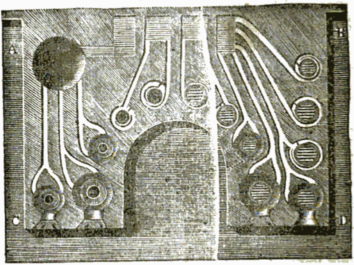
The doors of closed fire-places, if constructed of sheet iron, must be *double*, or be covered on the outside with a pannel of wood. By a double door, is meant, one door constructed of two sheets or plates of iron, placed parallel to each other; and so constructed, that the air which is between the two plates may be shut up and confined. The plates must not touch except at their edges, in order to their being fastened together: they need not however be more than one inch, or one inch and a half asunder. One of the plates may be quite flat, and the other a little convex. The end of the oven must be made quite flat, or level, so as to be perfectly closed by a flat surface placed against it. The door is this flat surface; and the greatest care must be taken, that it apply with accuracy, or touch the end of the oven in every part, when pressed against it, to prevent the escape of heated air.

In constructing closed fire-places for kitchens, I have found it to be a good general rule, to make the distance between the fire-place door, and the hither end of the bars of the grate, just equal to the width of the fire-place, measured just above the bars. In fire-places of moderate size, where double doors are used, it will suffice, if the distance from the hinder side of the inner door, to the hither end of the bars, be made equal to the width of a brick, or 4½ inches; but if the door be not double, it is necessary that the length of the passage from the door, into the place occupied by the burning fuel, should be at least six or seven inches.

In setting the iron frame of the door of *all* closed fire-places, care should be takan to mask the metal, by setting the bricks before it in such a manner, that no part of the frame may be seen, (if I may use that expression) by the fire. Otherwise the frame of the door will be heated; its form destroyed by the frequent expansion and contraction of the metal; the frame of the brick-work loosened, and air admitted over the fire, between the frame and the brickwork, and likewise between the frame and its door, which will no longer fit each other.

A good idea of the general plan adopted by Count **Rumford**, in constructing his kitchen apparatus; may be formed from the following cut of that of baron **Lerchenfield** at Munich, which the Count acknowledges to be the completest of any he ever caused to be constructed. Every man may accomodate this plan to his own kitchen, and to his own wants.

The mass of brick-work projects into the room, and the smoke is carried off by flues concealed in this brick-work, and in the thick walls of an open chimney fire-place which standing on it, on the farther side of it, where it joins to the side of the room, is built up perpendicularly to the ceiling of the room. At the height of about twelve or fifteen inches above the level of the mantle of this open chimney fire-place, the separate canals for the smoke concealed in its walls, end in the larger canal of this fire-place: which last-mentioned larger canal sloping backwards, ends in a neighbouring chimney, which carries off the smoke through the roof of the house into the atmosphere. The canals are cleansed by means of a strong cylindrical brush, of hog's bristles fixed to a long flexible handle of twisted iron wire.



The above cut shews an horizontal section of the mass of brick work in which the boilers are set, taken at the level of the horizontal flues, that carry off the smoke from the boilers, stew-pans, and sauce-pans, into the vertical canals, which convey it into the chimney. The smoke from three of the principal boilers, situated on the left hand, is carried by separate canals to a circular cavity, over which a large shallow boiler is placed, in which water is heated, (by this smoke), for the use of the kitchen. This boiler has a wooden cover, consisting of three pieces of thin flat board united by two pairs of hinges.[*]

The five fire-places on the left hand side of the mass of brick work, have doors or openings, closed with stoppers, for introducing fuel into these fire-places, and three of these openings are represented in the plan as being closed by their stoppers, while the fourth (that situated on the right hand) is shown open, or without its stopper.

As all the rest of the fire-places, being without any lateral openings, when any fuel is to be introduced, the stew-pan or sauce-pan must be removed for a moment for that purpose.

It will be observed, that several of the horizontal canals that carry off the smoke from the boilers, are divided into two branches, which unite at a little distance from their fire-places; this contrivance is very useful, as it occasions the flame to divide under the bottom of the boiler, and to play over every part of it a thin sheet.

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[*] In the Kitchen of the Military Academy at Munich, he added this contrivance. One of the three pieces of flat board forming the cover, is fastened down to the wooden rim of the boiler, by means of two small hooks of iron; and from the middle of this part of the cover, a long tin tube, about 1 1-4 inches in diameter, rises up perpendicularly to the ceiling of the room, and carries off the steam from the boiler out of the kitchen. In the kitchen of Baron L. a steam tube with a register rises from the ceiling of the room, ends in the open air, and is always opened to clear the room of any vapour.

In the *Public House of Industry* at Munich, the steam was carried up into rooms over the kitchen, where it passed through a spiral worm placed in a cask of cold water, which was thus warmed, and made use of the next day for filling the boilers. That this water might not be cooled during the night, the cask containing it was put into another cask still larger; and the space between the two casks was filled with coal. (Charcoal or ashes will answer; both these substances being bad conductors of heat.) These hints may be very usefully improved, and acted upon, on various occasions in domestic life.

The reason why flues were not made under these boilers, was, to render it possible to use occasionally several boilers of different depths in the same fire-place; a convenience of no small importance. Circular flues prevent this convenience, though they economise fuel.

They will be rendered unnecessary, provided that the flame be made to divide under the bottom of the vessel, (which may be done by causing it to enter the horizontal canal by two opposite openings), and provided that this canal be furnished with a good damper, WHICH OUGHT NEVER TO BE OMITTED.

The dotted lines leading from the front of the brick work to the fire-places, shew the position and dimensions of the ash-pit.

The whole length of the mass of brick work from A to B is eleven feet, and its width, from A to C, is seven feet four inches. The space it occupies on the ground may be conceived to consist of six equal squares of forty-four inches square each: these two rows being joined to each other by their sides, and forming together a parallelogram. And in laying out the work, when a kitchen is to be fitted up on the plan here described, it will always be best to begin by actually drawing these six squares on the floor of the kitchen. Nearly the whole of the middle square of the back row is occupied by the open chimney fire-place, and the greater part of the middle square of the front row, is left as a passage for the cook to come to the open chimney fire-place.

All the boilers, stew-pans, and sauce-pans, are fitted into circular rings of iron, which are firmly fixed to the brick work; and are suspended in their fire-places by their circular rims. Large boilers have two rings fitted to their rims.

Deep boilers economise space, and when furnished with good registers and dampers, the additional quantity of fuel they require, will be too trifling to be considered.

Common bricks were used in the construction of the fire-places, but care was taken to lay them in mortar composed of clay and brick-dust, without any sand, with only a very small proportion of lime.

Dampers are essentially necessary in the chimney or canal by which the smoke is carried off. These dampers should be opened more or less, as the quantity of air is greater or less, which is admitted into the fire-place. The register and damper will also be found useful in putting out the fire when not wanted. It is of little importance whether the dampers be placed near the fire, or far from it; or what is their form; provided they be so constructed, as to diminish at pleasure, and to close entirely the canal by which the smoke makes its escape.

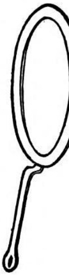
(A piece of sheet-iron is the simplest damper we can use.)

Of the construction of Kitchen Utensils.—Iron is certainly the best and safest metal for all Kitchen Utensils. The insides should not be scoured, as they are thereby disposed to rust: but merely washed out and rinsed with warm water, and wiped with a dry dish-cloth; the surface of the metal will soon become covered with a thin crust or coating of a dark brown colour, resembling enamel; which covering, if suffered to remain, and to consolidate, will at last become so hard, as to take a very good polish, and defend the surface from further corrosion; and consequently to prevent the food from acquiring that taste and colour, which iron is apt to impart to it.

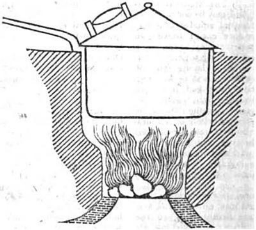
Iron utensils designed for frying, or cooking in fat, must never have hot water put in them. But when washed out, must be well wiped with a dry cloth before they are put away.

The most wholesome material for stew-pans and sauce-pans, is earthen ware, glazed with salt. See article POTTERY. But the application of sudden heat and sudden cold, must be avoided, as it will crack. The globular form is the strongest, and the thinner the utensil is made, consistent with strength, the better it will be.

The handles of sauce-pans should be rivetted to their insides, and the cover so contrived, as to fit the opening of the sauce-pan, by making a notch in one side of it to receive that part of the handle which is in the way. But when new pans are to be constructed, a circular rim of iron, flat on the under side, should be provided for each sauce-pan, with a handle belonging to it, of the form here represented:



And by forming this sauce-pan to its rim, its form at its brim will be circular, within and without, kept more easily clean, and rendered more durable, by reason of there being no iron rivets to be acted upon by the copper of the pan. The circular plate of tin, or of thin sheet copper tinned, which forms the bottom of the cover, should be of the same diameter precisely, as the outside of the brim of the sauce-pan. The bottom of the cover may either be made quite flat, concave, conical, or concave and of a spherical figure. The handle of the sauce-pan should be bended upwards, so as to be above the level of the brim of the sauce-pan; otherwise, when the utensil is in its place, there would not be room between the handle and the surface of the brick-work, for the fingers to pass in taking hold of the handle to remove the sauce-pan This is evident from a bare inspection of the following figure, which represents the section of a sauce-pan, fitted into its fire-place,



Of the management of the fire in heating an Iron Oven.—The strong draught into a well constructed fire-place, renders it necessary to keep the fire-place door constantly closed, and to leave but a small opening for the passage of the air through the ash-pit register. The fire-place should be small, and particularly the grate on which the fuel burns. For an oven or roaster of sheet-iron from eighteen to twenty inches wide, and from twenty-four to thirty inches long, and from twelve to fifteen inches high, the fire-place should never be more than six inches wide, six inches deep, and about nine, or at most ten inches long: the grate should be placed twelve inches below the oven, and this fire-place should seldom be half filled with coals. If the oven, or roaster (which see) be set in a manner that the flame or smoke from the fire spread round it on every side, there will be no want of heat for any of the common purposes of cookery, and its intensity may always be regulated by means of the damper in the chimney, and the register in the ash-pit door.

It is of great importance to cause the smoke that heats the oven, to descend at least as low as the level of the bottom of the oven, after it has passed round and over it, before it is permitted to rise up freely and escape by the chimney into the atmosphere. The oven will thus retain its heat for a great length of time. More effectually to prevent the fire from operating with too much violence, upon any one part of the bottom of the oven, the brick-work may be sloped outwards and upwards on every side from the top of the burning fuel, to the extreme parts of the sides and ends of the bottom of the oven, that the whole of the bottom may be exposed to the direct rays from the fire. In some cases the flame passes up both sides, and then descends by the end to the level of its bottom, or rather below it; and passes off backward and forwards in horizontal canals by the sides of the oven, before permitted to go off into the chimney. Either of these methods will answer, provided the smoke be made to descend, after it has left the top of the oven, as above, and provided the smoke canal be furnished with a damper.

In setting an oven, provision should be made, by leaving holes, to be stopped up with stoppers, for cleaning out all the canals in which the smoke circulates; these canals must never be less than two inches wide; and where they are not more than four or five inches deep, they should be from three to four inches wide, otherwise they will be very often choaked up with soot.

Holes closed with stoppers, must also be left in the brick-work, for cleaning the flues.

The fire-place for an oven of the smallest size should be nearly as capacious as one which is destined for heating a much larger oven; and I have found by repeated experiments, that a nest of four small ovens, set together, and heated by the same fire, will require but very little more fuel to heat them than would be necessary to heat one of them, were it set alone.

A cottage oven eleven inches wide, ten inches high, and sixteen inches long, will require a fire-place five inches wide, five inches high, and seven inches long: and for four of these ovens, set together in a nest, the fire-place need not be more than six inches wide, six inches high, and eight inches long.

I have in my house two iron ovens, each eighteen inches wide, fourteen inches high, and twenty-four inches long, set one over the other, and heated by the same fire; and their fire-place is only six inches wide, six inches high, and nine inches long.

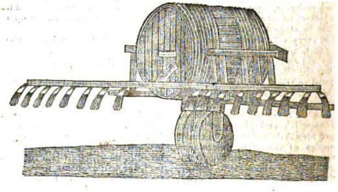
Having been thus particular in detailing the important principles respecting the economy of fire; and the arrangement of the kitchen apparatus of Count RUMFORD; the reader must be referred to the articles OVEN and ROASTER for additional information upon this interesting subject.

KITCHEN GARDEN, a piece of ground laid out for the cultivation of fruit, herbs, pulse, and other culinary vegetables.

A kitchen-garden ought to be situated on one side of the house, adjoining to the stable, whence the dung may be easily conveyed into the inclosure. As soon as the wall is built, MILLER directs a border to be formed beneath it, from eight to ten feet in breadth, on which, if in a southern aspect, the earlier plants may be raised. On those borders which are exposed to the north, some late crops may be obtained; but no pease, beans, or other deep-rooted plants, should be set too near the fruit-trees.

The ground is next to be divided into quarters, the size of which ought to be proportioned to the extent of the garden: because, if these divisions be too small, the soil will be wasted in walks; and as the quarters are generally inclosed by espaliers of fruit-trees, the vegetables which may be planted there, will not thrive for want of sufficient exposure. The walks should, therefore, be proportioned to the size of the ground; and in a small garden, they ought not to exceed eight feet; or, if it be a large one, from twelve to fourteen feet in breadth. It will also be advisable to place a border, three or four feet wide, between such walk and the espalier, in which may be sown small salads, or any similar vegetables, that do not take deep root, or continue long in the ground. These quarters, however, ought not to be planted or sown, for raising the same crops two successive years; and the warmest soil, or that which is next to the stable, where it is best sheltered from the cold winds, will be the most proper for hot-beds, to promote the growth of early cucumbers, melons, &c. The most important points in this, as well as every other branch of horticulture, consist in digging and manuring the land *well*; in allowing a proper distance to each plant, according to its different growth; and, particularly, in eradicating all weeds; an object that will be considerably facilitated by continually extirpating them from the dunghill; as, otherwise, their seeds or roots will be constantly introduced into the garden, and propagated with the manure.

Another circumstance of equal importance, is the *watering of gardens*, for which the implements commonly employed appear to be very inadequate. The filling, and carrying, of these vessels to the spot where they are to be used, are attended with great labour and loss of time. To remedy these inconveniencies, different machines have been invented: one of the most ingenious and useful, is that contrived by M. SYLVESTRE, and of which the following is an accurate representation:



It consists simply of a cask, capable of holding a sufficient quantity of water, for the purpose of irrigating the garden. The hinder part of this vessel is furnished with a cock that communicates with the watering pipes, and the cask is supported on a strong frame, with one or two wheels, calculated for walks about 18 inches wide. The carriage may be drawn by a mule or an ass, and requires a person to guide the animal; to support the vessel when it is liable to be overturned; and to open and shut the cock as often as is necessary. Thus, one man will be able to water a considerable space of ground in a short time, and to sprinkle that fertilising fluid in an equable and regular manner. For further particulars see the different articles of culture under their proper heads.

KNAWELL, or *Scleranthus*, L. a genus of plants comprising three species, viz. the *annuus*, Annual Knawell, or German Knot-grass, which grows in sandy soils and corn-fields; flowers in the months of July and August.

KNEE GRASS. See ROUGH PANIC-GRASS.

KNEE-HOLLY, or *Ruscus*, L. a genus of plants, consisting of several species, one of which is indigenous, namely, the *aculeatus*, Common Knee-holly, Butchers'-Broom, or Prickly Pettigree. It grows in woods, thickets, and hedges; flowers in the months of May and June.

This plant is much used by butchers, for brooms to sweep their blocks. Branches of it are likewise employed by hucksters, to defend their bacon and cheese from *mice*; because these vermin cannot penetrate through the prickly leaves. The root of the knee-holly is reputed to be aperient, and is chiefly used in diet-drinks, for removing slight obstructions of the viscera, and promoting the fluid secretions.

KNIFE-BOARD. A common knife-board covered with thick buff-leather, on which are put, emery one part, *Crocus Martis* three parts in very fine powder, mixed into a thick paste with a little lard or sweet-oil, and spread on the leather the thickness of a quarter-dollar, gives a far superior polish and edge to knives, and it does not wear the knife near so much as the common method of using brick-dust on board.

KOUMISS. See HORSE.

L.

L, the twelfth letter, and ninth consonant of our alphabet. It is called a semi-vowel, formed in the voice by intercepting the breath between the tip of the tongue and the fore-part of the palate with the mouth open. There is something of aspiration in its sound, and therefore the Welsh usually double it, or add an *h* to it, as in *llan*, or *lhan*, a *temple*. In English words of one syllable, it is usually doubled, as in *well*, *wall*, but in words of more than one syllable it is only single at the end, as *foretel*, *label*. As a numeral L stands for 50; L with a dash over it thus, $\bar{L}$, 50,000.

LABDANUM, or LADANUM, a resinous juice exuding from the *Cistus creticus*, L. a native of the Levant, whence it is imported. The best sort, (which is extremely rare even in Turkey), consists of very dark-coloured, soft masses, and almost liquefies, when held in the hand: it emits an agreeable odour, especially while burning, and has a slightly pungent, bitterish taste. This medicinal drug is chiefly used externally, for attenuating and discussing tumors.

LABORATORY, is an essential part of the farm establishment. In this house, all the operations, which are too commonly performed in the kitchen, to the great danger of those present, may be easily attended to. An important use to which this house may be applied, is, that of smoking the meat hanging on cross beams above, with the smoke from the fire below. For this purpose, there should be dampers of sheet-iron through the flue of the chimney, and holes of the size of a brick edgewise left for the smoke to issue. When the smoke is not wanted, these may be easily stopped.

LABOUR, in a general sense, implies the exertion of human strength in the performance of any kind of work.

The *price* of labour has, at all times, varied; and, as the poorer classes feel, with additional rigour, every evil arising from the pressure of the times, different expedients have been devised, with a view to alleviate their burthens, supply their wants, and render them more comfortable.

From these investigations, it appears that, in the middle of the fourteenth century, (in England,) the usual price of labour was 2*d.* per day; and wheat was sold at from 3*s.* 4*d.* to 4*s.* per quarter, of eight bushels.

In the middle of the fifteenth century, the pay of a labourer per day, was 3*d.*; and wheat cost from 5*s.* to 5*s.* 6*d.* per quarter.

In the earlier part of the sixteenth century, the price of labour rose to 3½*d*, and that of a quarter of wheat to 7*s.* 6*d.* About the middle of the seventeenth century, the pay of a labourer, upon an average, was (in Essex) 13*d.*; and corn had risen to 40*s.* per quarter.

Toward the latter end of the eighteenth century, the daily pay of a labourer was from 14*d.* to 18*d.* in the country, and from 2*s.* to 2*s.* 6*d.* in the metropolis; while the price of wheat was 48*s.* per quarter. We forbear to state the average pay of labour during the late exorbitant prices of grain, and every other article of food; when all proportion between *merit* and *reward* appeared to have been suspended.

The payment of *daily* wages, however, serves but imperfectly to ascertain the *real* price of labour; as a considerable portion of work is performed by the piece; so that a labourer in general earns from 3*d.* to 6*d.* per day more than by the common pay. For, without this, or some similar method, the reward of labour would be inadequate to the maintenance of those numerous persons, who possess no other means of providing for their infirm wives, or hapless children. And we conceive, that if their wages could be so regulated as to rise and fall with the price of wheat, considerable benefit would thus result to society.

The curious and philanthropic reader, who feels an interest in this popular inquiry, will be fully gratified by a perusal of Mr. Davies's *Case of Labourers in Husbandry stated and considered,* &c. 1795, and Sir F. M. Eden's *State of the Poor*, &c. 1797, in which the situation of the labouring classes is clearly developed.

LABURNUM, the **Broad-leafed**, *Cytisus laburnum*, L. a valuable exotic tree, introduced from the Alps, into the Highlands of Scotland.

This plant is very hardy, and will thrive on poor shallow lands, and in exposed situations: it is propagated by seeds, which should be deposited in March, in a light and rather moist soil, where the tree is intended to remain; and, in the succeeding month, young shoots will appear. But, if sown in autumn, the seeds do not germinate till the following spring.

The broad-leaved laburnum forms an agreable ornament for parks and gardens; as it grows rapidly, with a straight stem, and, in the course of four years, is generally twelve feet high. Its wood is frequently employed on the Continent of Europe, and in the Highlands, for making chairs, tables, and other articles of household furniture, which are said to resemble the finest mahogany. Suckow remarks, that a decoction of the fresh branches and leaves of this tree, imparted an excellent dark-brown colour to cloth prepared in a solution of green vitriol.

Labyrinth. See Maze.

LAC is a resinous substance, the production of an hemipterous insect (*Coccus ficus*) which is found on three or four different kinds of trees in the East Indies.

The head and trunk of the lac insect seem to form one uniform, oval, and compressed red body, about the size of a flea. The antennæ are thread-shaped, and half the length of the body. The tail is a little white point, from whence proceed two horizontal hairs as long as the body.

These insects pierce the small branches of the trees on which they feed; and the juice that exudes from the wounds is formed by them into a kind of cells, or nidus for their eggs. Lac is imported adhering to the branches in small transparent grains, or in semi-transparent flat cakes. Of these the first is called *stick lac*, the second *seed lac*, and the third *shell lac*.

On breaking a piece of stick lac it appears to be composed of regular honeycomb-like cells, with small red bodies lodged in them; these are the young insects, and to them the lac owes its tincture; for when freed from them its colour is very faint. Seed lac is the same substance grossly pounded and deprived of its colouring matter, which is used by dyers and for other purposes; and shell lac is the cells liquefied, strained, and formed into thin cakes.

This substance is principally found upon the trees in the uncultivated mountains on both sides of the river Ganges; and it occurs in such abundance that, were the consumption ten times greater than it is, the markets might readily be supplied. The only trouble which attends the procuring of it is to break down the branches of the trees and carry them to market.

The uses of lac in its different states are various. It is employed in the East Indies for making rings, beads, chains, necklaces, and other ornaments for female attire. Mixed with sand it is formed into grind-stones; and added to lamp-black or ivory-black, being first disolved in water with the addition of a little borax, it composes an ink, which when dry is not easily acted upon by moisture. A red liquor obtained from the lac is employed as a substitute for cochineal in dyeing scarlet, and in painting. Shell lac is chiefly adopted in the composition of varnish, japan, and sealing-wax. A tincture prepared from lac is sometimes used in medicine.

LACE, in commerce, a texture composed of several threads of gold, silver, silk, or thread, which are interwoven and worked on a cushion with spindles, according to the pattern designed.

There are various kinds of lace, denominated either from the place where they are manufactured, or from the particular method of working. Such are Point, Brussels, or Flanders' lace, made in the Netherlands; and blond or bone-lace, which is produced in England, chiefly in the county of Buckingham.

When gold or silver lace happens to be tarnished, the best liquid that can be used for restoring its lustre, is spirit of wine, which should be warmed, before it is applied to the tarnished spot. This, in Dr. Lewis's opinion, is far preferable to soap, or the alkaline liquors usually employed; as the former does not remove the colour of the silk or other embroidery, with which the lace may be connected.

Method of separating gold or silver

from lace, without burning it :—Let the lace be first cut to pieces, tied up in a linen cloth, and boiled in soap-ley, till its size be considerably diminished: the cloth is now to be taken out of the liquid; rinsed repeatedly in cold water; and beaten with a mallet, in order to extract the alkaline particles. On opening the linen, the metallic part of the lace will be found pure, and undiminished, while it retains its natural brightness.

LACERTA, the lizard, a genus of amphibia of the reptile order, of which there are upwards of eighty species. The following claims principal attention. Lacerta Crocodilus, or the crocodile, is a native both in Africa and Asia, but is most frequently found in the former, inhabiting its vast rivers, and particularly the Niger and the Nile. It has occasionally been seen of the length of even thirty feet, and instances of its attaining that of twenty are by no means uncommon. It principally subsists on fish, but such is its voracity, that it seizes almost every thing within its reach. The upper part of its body is covered with a species of armour, so thick and firm, as to be scarcely penetrable by a musket ball, and the whole body exhibits the appearance of an elaborate covering of carved work. It is an oviparous animal, and its eggs scarcely exceed in size those of a goose. These eggs are regarded as luxuries by the natives of some countries of Africa, who will also with great relish partake of the flesh of the crocodile itself.

On its native climate its power and propensity for destruction are unquestionably great, and excites in the inhabitants of the territories near its haunts, a high degree of terror. It lies in wait near the banks of rivers, and with a sudden spring, seizes any animal that approaches within its reach, swallowing it by an instantaneous effort, and then rushing back into its watery recesses, till renewed appetite stimulates the renewal of its insidious exertions.

LACHRYMAL gland; that which secretes the tears, and conveys them to the eye by its ducts, of which there are six or eight in number.

LACK *of rupees:* in the East-Indies, equal to 100,000 rupees, which are worth at the standard price 2*s.* 6*d.* each, of course the *lack* is worth 12,500*l.* sterling = $ 55,555 55.

LACKER, or Lacquer, is a kind of varnish, applied to brass, tin, and other metals, in order to improve their colour, and to prevent them from tarnishing.

The best lacquer is prepared from rectified spirit of wine, and *seed-lac*, in the proportion of three ounces of the latter to one pint of the former. The mixture is digested for some hours in a moderate heat; when the liquor is strained, and left to subside. In this state, it is ready to receive the shade required, by adding gamboge, anotta, or other tinging drugs.

With a view to impart a golden colour to metals, two parts of gamboge are usually added to one of anotta; but a better method is, to dissolve those substances separately, and to ascertain the particular shade, by mixing different proportions of the two solutions. If silver or tin are to be lacquered, it will be necessary to employ a larger quantity of the colouring matters than is required, when this kind of varnish is to be applied to brass.

LACKEY-MOTH, or *Phalæna Bombyx Neustriæ*, is a species of moth that commits great depredations on fruit-trees; around the branches of which it deposits numerous eggs, that exhibit the appearance of a necklace. These are very hard, and adhere closely to the bark; so that it becomes necessary to remove them by a knife; care being taken to spare the bark as much as possible. Next, the composition and powder mentioned in the article Tree, must be applied to every part which may have been wounded by the instrument.

LACTEALS, in physiology, are the absorbing vessels of the mesentry, and consist of certain small tubes, situated in the intestines; whence they convey the *chyle*, or that milky fluid which is generated from the food in the first passages, into the common reservatory, or the mass of the blood. They are furnished with an incalculable number of valves, which prevent the return of the chyle into the stomach: in their passage through a number of glands, the nature of the last mentioned fluid is considerably altered, and prepared for its assimilation with the blood.

LACTIC acid, a peculiar acid found in milk, upon which depends the facility with which milk undergoes the acetous fermentation. Hence Lactats are formed with the Lactic acid and certain bases.

LADIES'-MANTLE, or *Alchemilla*, L. a genus of plants comprising four species, three of which are indigenous, and of these, the principal is the *vul-*

garis, or Common Ladies'-mantle, growing frequently in meadows and pastures: it flowers from June to September.

LADIES'-SMOCK, or *Cardamine*, L. a genus of plants consisting of sixteen species, seven of which are indigenous: the principal of which is the *pratensis*, or Common Ladies'-smock, growing in meadows and moist pastures; it flowers in the month of May.

LAKE, in geography, or, more strictly, hydrography, a sea having no apparent communication with the ocean.

Lakes are of two classes; either temporary, or perennial.

I. Temporary lakes are formed by inundations; certain favourable tracts of ground affording a receptacle for the superfluous waters, which remain there till evaporated. Of this order are those created by the overflowing of the Nile and the Niger, and by the rains, and melted snow, in Muscovy, Lapland, and their adjacent countries; and those which, in India, are filled by the rains of the monsoons, and only maintained throughout the year, by the industry of the inhabitants, which has surrounded their beds with stone embankments.

II. Perennial lakes are of four descriptions, 1. such as neither receive nor emit any river; 2. such as do not receive, but yet emit one river or more; 3. such as receive, but do not emit one river or more; 4. such as both receive and emit one river or more.

1. Those lakes which neither receive nor emit rivers, exist because they are supplied by springs, rising in their own beds; and emit no rivers, either because their surface is too low, with respect to the surrounding land, or their banks too high to allow their waters to escape, or because the supply of their springs does not exceed their loss by evaporation; or, because of a combination of these circumstances.

2. Lakes that receive no river, but yet emit one or more, are the waters of those which, supplied as the preceding kind, are not, like them, restrained within their banks. These lakes, which are strictly heads, or reservatories, of water, are the most ordinary. Such are the Wolga, at the head of the river Wolga; the Odium, at the head of the Tanais; the Ozero, or White lake in Muscovy, the source of the river Shacksna; the Chaamy, which emits four very large rivers, the Menan, the Asa, the Caipoumo, and the Laquia.

3. Those lakes which receive rivers, but emit none, apparently owe their origin to those rivers which in their progress from their source, falling into some extensive cavity, are collected together, and form a lake of such dimensions, as may lose as much by exhalation, as it continually receives from these sources: of this kind is the Caspian sea; the lake Asphaltites, also called the Dead sea; the lake of Geneva, and several others.

4. Those which both receive and emit rivers, include some varieties, as the quantity they emit is greater, equal, or less than they receive. If it be greater, it is plain that they must be supplied by springs at the bottom; if less, the surplus of the water is probably spent in exhalations; and if it be equal, their springs just supply what is evaporated by the sun.

Lake, in the imitative arts, signifies a red colour employed by painters, which was originally formed of *gum-lac*. It is at present prepared chiefly from scarlet rags, cochineal, or Brazil-wood. The best, however, is obtained from the first of these articles, in the following manner:

First, let a pound of pearl-ash be dissolved in two quarts of water, and the solution be filtred through paper. A pound of clean scarlet shreds, and two quarts of water, are next to be added to the liquor, and the whole boiled till the rags are perfectly divested of their tinge; when they are to be taken out and pressed. Three additional pounds of shreds are now to be boiled in the same solution; and, during this process, a pound and a half of the bone of cuttle-fish are to be dissolved in one pound of aqua-fortis. This liquid is next to be combined with the former solution; and the whole, on being suffered to subside, will deposit a sediment, which forms what is called *lake*. The liquor is then to be strained, and the sediment mixed four or five times, successively, in two gallons of spring water, till all saline particles are extracted; lastly, it is to be drained, and dropped through a funnel on clean boards, when the lake will assume the form of cones or pyramids, in which it must be suffered to dry, and the preparation will be fit for use.

For a more simple method of preparing different lakes, or pigments, the reader will consult the article Colour.

LAMB, the young of a sheep; which, if a male, is during the first year, called a *wedder*, or *wether-hog*; and if a female, a *sheave*.

The most proper time for ewes to *lamb*, is from the latter end of April to the beginning of June; and, in the course of sixteen or eighteen weeks, the young animals may be taken from their dams: they are, howevery, very tender, and require the greatest attention, especially during snowy weather, when they not unfrequently perish from want of fresh grass, and their aversion to eat hay. In order to remedy this inconvenience, it has been recommended to turn a few old sheep that are generally fond of hay, among the lambs, which will thus be speedily induced to follow their example.

Lambs are subject to few disorders: when they are sick, the drinking of mare's or goat's milk, diluted with warm water, will greatly tend to preserve them from taking cold; and as many, when yeaned, are apparently dead, it is advisable to blow into the mouth and nostrils; by which simple method numbers have been immediately restored.

The most fatal distemper, however, with which lambs are affected, is the *blood* or *red-water*. The disordered animals are, in general, seized with lameness, and a slight swelling of the joints, but which is attended with a violent inflammation, that spreads over the whole body, and, if neglected, proves fatal in the course of 24 hours.

The red water is occasioned by too great a quantity of undigested food remaining on the stomach. As soon, therefore, as the lambs are attacked, the best method hitherto known is, to take them from grass, bleed them, and administer an emollient clyster, which is to be repeated, in case no evacuation take place in a short time. Two or three grains of tartar emetic, or as many ounces of sweet-oil, are now to be given, and the bleeding repeated, if the animals do not appear to recover. This treatment is to be continued for the space of four or five days, during which the diseased creatures should be fed with milk.

Lamb forms a considerable article of food: being light and wholesome, it is well calculated for weak and delicate stomachs, though less nourishing than mutton. *House-lamb*, which is thus denominated from the animals being fed and fattened within doors, is neither so wholesome nor so nutritive as the natural meat. Its flesh is devoid of taste, and eaten only by epicures, who, regardless of the dictates of reason, and the rules of temperance, attend only to the gratification of their sensual appetites. See SHEEP.

LAMB'S LETTUCE. See CORN SALAD.

LAMB'S QUARTERS. See Wild ORACHE.

LAMENESS, a weakness that may arise from various causes, in any part of the body.

Where this defect originates from natural deformity, it is generally incurable: few instances, however, occur in which lameness is hereditary; though it may also be induced by causes that are difficult to be discovered. If it be occasioned by external accidents, such as luxation of the thigh at the birth, fractures, &c. it can be cured only by a skilful reduction of the dislocated limbs, though it will always be attended with *halting*.

Frequently, however, the leg, in consequence of the rigidity of the muscles destined to put it in motion, contracts to such a degree that it cannot be moved without limping. In this case, it will be advisable to apply emollient fomentations; to immerse the part affected in mollifying baths; or, for very robust individuals, to expose it frequently to the action of a pump from mineral springs, and to wear a shoe furnished with a leaden sole, the weight of which should be proportioned to the contraction of the limb.

Much lameness, as well as deformity, might certainly be prevented, if a stricter attention were paid to the early treatment of children. These are often afflicted with a weakness of the hips, accompanied with a lameness of both sides of the body; which is wholly occasioned by inducing them to walk without any assistance, before they have attained sufficient strength to support themselves. Such debility may, in some measure, be counteracted by tying a girdle round the waist, that should extend to the whole circumference of the belly; and which, if well braced at the hips, will invigorate the loins, while it gradually enables children to walk. It will also be advisable to bathe such weak limbs in astringent decoctions, frequently in the course of the day, for several months. See RICKETS.

Besides these common causes of lameness, there are various other circumstances which our limits will not permit us to discuss, as they relate peculiarly to surgery. A practical work on this subject is much wanted; and we conceive it would be of essential service to society, if a popular treatise were properly executed, in which the manifold causes of lameness might be discriminated, and the most appropriate remedies judiciously stated, according to the different stages of the affection.

Lameness, *in Horses*. See **Halting**.

LAMP, a vessel containing oil, or other inflammable matter, for the purpose of affording light.

The utility of lamps in domestic life, is universally acknowledged; we shall, therefore, proceed to state such patents as have been granted for the inventions or improvements relative to this branch of manufacture, without discussing those theories in which ingenious men have occasionally indulged.

The first we shall notice is, that of M. Argand, who obtained a patent in 1784: his privilege being now expired, and his invention generally adopted, we shall briefly observe, that the superiority of his lamp depends on the admission of a larger volume of air to the flame, than is practicable on the common plan. This object is effected by employing a circular wick, so that a strong current of air rushes into the cylinder round which the wick is placed, and thus, together with the atmosphere, excites the flame to such a degree, that the smoke is entirely consumed. The light and heat are by this method remarkably increased, while the expense of the oil is considerably reduced; because those particles, which, in the usual lamps, are dissipated in smoke, will, by M. Argand's invention, be converted into a brilliant flame.

We have already pointed out, (in article Candle) the superior utility of lamps, especially for sedentary or studious persons; but as the light emitted by them is frequently too vivid for weak, or irritable eyes, we would recommend the use of a small screen, which should be proportionate to the disk of the flame, and be placed at one side of the light, in order to shade it from the reader's eye, without excluding its effect from others, or darkening the room. Such a contrivance is equally simple and useful; it may consist of either paper, or taffety, slightly gummed; and, being easily folded and carried in the pocket, is far superior to the common screens.

We cannot conclude this article, without pointing out another circumstance in which lamps are superior to candles, namely, their *cheapness*. From experiments made some years since, with the express view of ascertaining the expense of burning chamber-oil, it appears that a common taper-lamp, with eight cotton threads in the wick, consumed in one hour about one-third of an ounce of spermaceti oil, which at that time cost 2*s*. 6*d*. per gallon; so that the expense of burning for 12 hours, amounted to 4·57 farthing, or about one and an eighth of a penny. The light emitted by such lamp was as clear and bright as that yielded by candles, which run from eight to ten in the pound. Subsequent trials were made with M. Argand's lamp; the result of which was, that the latter will continue to burn *three* hours for the value of *one* penny. And though a candle, when newly snuffed, may appear to be preferable, yet the lamp is ultimately superior, both for steadiness and durability of light. Nay, one good lamp proved equal in its effect to half a dozen tallow candles, consisting of six in the pound, the expense of which was *eight pence*, while that of the lamp amounted to only *two-pence half-penny*, in the space of *seven* hours.

LAMP-BLACK, is one of the black colouring matters, the preparation of which has already been stated.

We again introduce this substance, as it possesses several remarkable properties: thus, lamp-black is liable to undergo spontaneous inflammation, if it be kept for some time closely confined, and be afterwards suddenly exposed to the air: there have been instances of its taking fire in shops, and occasioning the most distressing scenes of conflagration. But, when lamp-black is combined with oil, so as to form a black varnish, it appears from various experiments, that bodies painted with this compound resist the effects of electricity in a most surprising degree; and that they have, in a variety of cases, even repelled lightning.

In 1798, a patent was granted to Mr. William Row, for a new-invented mineral lamp-black. This is obtained from pit-coal, or any other kind of fossil coal; the blackest particles arising from the smoke of which, are deposited in certain tubes, or receptacles, whence they are removed in the course of six or eight days, and packed up for sale. For the particulars of this patent, the inquisitive reader will consult the 10th vol. of the *Repertory of Arts*, &c. where the process is duly specified.

LAMPAS, in FARRIERY, denotes an excrescence in the roof of a horse's mouth, which is sometimes so luxuriant that it grows above the teeth, and thus prevents his feeding.

This malady may be cured by cauterising the flesh with a hot iron; an operation which should be carefully performed by a skilful veterinary surgeon, lest the swelled part be penetrated so deep, as to scale off the thin bone that lies under the upper bars: after having thus extirpated the tumor, it will be necessary to anoint the sore parts with burnt alum and honey, which form a very proper application to an ulcerated mouth in general.

LAMPREY, or *Petromyzon*, L. a genus of fish comprising three species, which are chiefly distinguished by their peculiar back fins.

1. The *marinus*, or SEA LAMPREY, which, in shape, resembles an eel, has small eyes, covered with a light blue membrane, and the pupil is encompassed with a gold-coloured ring. During cold weather, this fish conceals itself in the crevices of rocks; on the pebbly edges of which it is an usual expedient among anglers, to form pits extending to the water-side: into these a little blood is thrown, to induce the lamprey to put forth its head between two rocks. As soon as the hook, which is to be baited with crab, or some other fish, is presented, it is greedily swallowed, and thus the prey is easily taken.

2. The *fluviatilis*, or LESSER LAMPREY; the mouth of which is like that of the preceding, but the colour of its back is either brown or dusky, sometimes mixed with blue, the whole underside being silvery.

These fish sometimes grow to the length of ten inches, are found in the rivers Thames, Severn, and Dee; are potted with the larger kind, and occasionally preferred, on account of their milder flavour. Vast quantities are taken about Mortlake, and sold to the Dutch, who employ them as bait for their cod fishery. It is computed that above 430,000 have in one season been vended to them at 40*s*. per thousand; as they possess the secret of preserving the lamprey till the turbot fishery commences.

3. The *bronchialis*, or LAMPERN, which is found in the Isis, near Oxford, and other British rivers; it is about eight inches long, and the body does not exceed the thickness of a swan's bill. Unlike the other species, lamperns conceal themselves in the mud, and never adhere to stones, or other matters.

The flesh of these fish, in general, is white, fat, soft, and easy of digestion: it has an agreeable taste, and is not less nutritive, though more wholesome, than that of the eel: those of a larger size, however, possess a superior flavour.

LAMPYRIS, in entomology, the *fire fly*.

There are eighteen species of this genus, the most remarkable of which is the *noctiluca*. The male of this insect is less than the female, which is commonly known by the name of *glow-worm*.

The glow-worm is seen about the months of June, July, and August. The light which is perceived toward the lower extremity of its body, is produced by a phosphoric liquor. The animal has the power of varying the degree of its brightness, and even of wholly extinguishing it; so that if an observer approach the spot where he has perceived it, it often happens that the creature renders itself wholly invisible. It seems probable, that it does not emit light, either when moving, or when apprehensive of danger. The lights, which are perceived along the ground, are never seen to change their places; and if the insect be taken, and carried in such a manner that it is itself at rest, it will shine during the whole journey, yet when set down, even in the dark, it will immediately withdraw its luminousness. If, in this case, a light be procured, it will be found that it is crawling in search of a station.

The glow-worm has a slight, but very slight, resemblance to the beetle kind. The upper part of its body is of a dull brown colour, and the under of a whiteish, tinged with red. Its luminousness serves the double purpose of making it discoverable to its own kind, and to the animals of which it is a prey.

LAND, in general, signifies any kind of ground, but is particularly applied to such as is ploughed or tilled for agricultural purposes.

As we treat, in alphabetical order, of the different methods of cultivating the earth, we shall at present confine our attention to the proper modes in which waste, or other soils, may be most advantageously converted from a natural and unproductive, into an artificial state.

The best method of ameliorating *swampy ground*, after it has been properly drained, is to pare and burn it. Where the earth, however, is dry, and the soil or mould so thin that it will not admit of paring the surface, the most effectual mode of bringing it into tilth, will be to plough it well, and turn the grass-sods inward. As soon as the new surface is mellowed with frost, the field should be harrowed, in order to fill up all the seams: thus, the air will be excluded, and the sod become perfectly rotten. In this state, it ought to lie during summer, and the succeeding winter; but early in the following May, it will be requisite to *cross-plough* the whole, after which the earth must be well pulverised with a brake-harrow, and thus prepared for a future crop.

Swampy land is recovered sooner by sowing HERD-GRASS than by any other mode. See that article.

The following excellent practical directions, for bringing waste lands into cultivation are taken from Dr. JAMES ANDERSON's Rural Essays, vol. iii.; a work which cannot be too warmly recommended to all those who wish to derive the greatest profit from their farms.

The object that an improver of waste land ought to have chiefly in view, should be to have it laid down into profitable grass land, so soon as that can be *properly* accomplished; and the undertaker should be cautious not to push forward with his improvements faster than the circumstances he is in will permit; and, in particular, never to go beyond the bounds that the manures he can command are sufficient to accomplish *completely*.

Lime is more valuable than any other manure, and the first questions ought to be, in an undertaking of this sort, *where can lime be obtained*, at *what price*, and in *what quantities?* But lime on poor soils is an inefficacious manure, unless where it is applied in very considerable quantities at once. Less than 300 bushels he accounts too little, in almost any case: and dung ought to be used the same season, as they will produce more powerful and aggregate efforts, than if either had been separately applied; the lime enabling dung to operate upon the soil in a manner it never otherwise would have done; but care must be taken not to exhaust the soil after it has been thus enriched, before it be laid down to grass.

In every case, he adds, the sooner the lime is laid upon the soil, after the trenching process has been completed, and the surface smoothed, and the more quickly and intimately it can be blended with the mould, the better it will be on every account Hence lime should always be spread while it is yet in its dry and powdery state; and ploughed and harrowed in, as soon as possible after it is spread, to prevent its running into clots by moisture.

Dr. A. further observes, that it is most advisable to spread the lime when in its dry, powdery state, immediately after slacking, and to plough for the first time after, with a more shallow furrow than usual, because at that time, a larger proportion of it is turned into the bottom of the last made furrow than at any succeeding ploughing, and therefore more of it will be buried beneath the staple, than at any other time, if the furrow shall have been deep.

If manure be not at hand, it is necessary to bring crude soils into a proper tilth for grass, by *summer fallowing*. In general, one year of fallow will be required at first, a crop of turnips may be had the second season, by which time the field will be reduced to that husband-like state, which a good farmer ought ever to aim at.

The *second ploughing* ought to be as deep as the nature of the soil will admit. If the subsoil be retentive, and the stratum below of a good quality, or better than that on the surface, (which is common where heath abounds) it ought to be opened to the depth of *twelve inches*, and if it be to fourteen or sixteen inches, the soil being still good, so much the better. No plough in stiff soils, will go to such a depth at once; where, therefore, stones are absent, it may be done by means of two strong ploughs, the one following the other in the same furrow In this case the first plough must have its mould-board set so as to make a very wide furrow, and the plough that follows, ought to have a narrower mould-board, so as to lift up the earth loosened by its share, to the top of the other furrow.*

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* Richard Peters, Esq. of Philadelphia, has the mortice in the plough beam long, for trench ploughing, so as to admit of altering the inclination of the coulter, as he wishes to go deep or shallow. He first runs as deep a furrow as possible, and then pares off the sod two inches deep with a light plough, and broad furrow, turning this sod into the trench, with all its weeds and roots. These are covered with the large plough,

Turnips are proper for unmellowed soils. The Swedish turnip, *Ruta Baga*, is particularly proper. It thrives exceedingly on stiff ground: but the turnips ought to be drilled, and thoroughly horse-hoed. The dung should be applied in drills before sowing. Two crops of turnips may be taken in succession, and they will reduce it to a fine tilth, and render it in excellent condition to be laid down with grass-seeds along with the first corn (grain) crop.

Peas, or vetches, may be sown on stiff soils, where turnips cannot be ventured: and those that run much to haulm, should be preferred.* Potatoes may also be raised as a first crop, to advantage. Rye and oats likewise succeed well on unmellowed ground.

Grass seeds should be sown with the first corn (grain) crop, with an intention to allow the field to remain in grass, till the whole portion of waste has been brought under culture.

Burn breaking—where the surface of waste grounds is covered with a thick coat of *dry benty grass*, it will often prove beneficial to pare and burn the surface. This operation does not consume the mould, nor change the soil of waste ground for the worse. All that the fire does is to consume the dried vegetable fibres intermixed with the soil, during which process a small proportion of alkaline salt is generated, which is known to act as a powerful manure. See also Paring.

Experience confirms the propriety of giving only a very slight ploughing after the burning, before the seeds are sown. If the sward be properly burned and spread in due time, and if lime be mixed with it, and slightly ploughed in for turnips, an abundant crop will be obtained without dung. This crop will afford a great quantity of dung while the soil will be more mellowed than if it had been left under a bare summer fallow. If the same field be next year dunged, and sown with turnips, it will afford a still more abundant crop, and the soil will by this time be reduced into the most excellent tilth for being laid into grass.

Sheep are the stock best fitted for the most barren soils.

The propriety of Trenching, above recommended by Dr. Anderson, cannot be too warmly urged to farmers who wish either to renew their worn out soils, or to cultivate unimproved land. R. Peters, Esq. in his address to the Blockley and Merion Agricultural Society, in the county of Philadelphia, has borne a decided testimony in favour of it; but properly observes that the depth of trenching must be regulated by the staple: and that there are some soils not proper for wheat, and evidently improper for trenching, though these are few. He asserts that wheat will penetrate three feet, if the soil permit; and that some horizontal roots have been measured ten feet. It can hardly be expected that the plants will therefore perfect themselves in a depth of three or four inches.

The advantages of the practice of trenching and deep ploughing, are also detailed by Dr. De Normandie, in his address to the Burlington *Agric. Soc.* and in a pamphlet by T. Moore, of Montgomery county, Maryland, entitled, "*The great error of Amer. Agriculture exposed*," a work which should be in the hands of every farmer.

The *utility* of *paring and burning* recommended by Dr. Anderson, is enforced in the last vol. of the "*Trans. of the Board of Agric. of England*," in several papers; from one of which, by the Rev. E. Cartwright, a practical farmer, an extract may be found under the head Paring.

LAND DITCHING, or **Hollow-draining,** is practised chiefly in the counties of Essex and Hartford. It consists in digging both main and side-drains, similar to those generally adopted in draining land: the former are usually made from 22 to 24 inches, the latter from 20 to 22 inches, in depth. The soil is previously ploughed; and the length to which the main drains may be protracted, without a vent, depends upon the situation of the land: when it has a regular declivity, the most proper method will be to carry off as much water as possible, by means of side-drains; but if the ground be irregular, it will be requisite to form additional main-drains, so that every advantage may be derived from the vallies, into which the latter must often be conducted to a considerable extent.

The length of the side-drains varies according to the elevation of the soil: in general, they need not be more than

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somewhat narrower than the small one, which runs in the same furrow. He is satisfied with finishing three quarters of an acre in a day.—Dr. Mease.

* The Magothay, Ray-bean, would answer very well. See article Cassia, Chamæcrista: as also the Lady pea, and Indian pea of New Jersey.—Dr. Mease.

one rod apart from each other; though in very loose or porous grounds they may be dug at a distance of one rod and a half. When the trenches are cut to a sufficient depth, they are filled up, and covered in the usual manner with straw and bushes. The expense of this method of draining is computed to be nearly 3*l* per acre.

Land-ditching, not only carries off the water from wet or marshy soils, but also ameliorates stiff loamy clays; which, being thus better enabled to resist the long-continuance of moisture on their surface during the winter, promote vegetation very early in the spring, and the grass is rendered of a superior quality. The weeds, &c. change their colour, and are totally divested of their rankness; the corn also increases both in quality and weight. Another important advantage arising from this practice, is, that it will admit of the soil being ploughed at an earlier period of the spring, and later in autumn; while it may be tilled with greater facility, and kept clear from weeds at a very small expense.

LANGUAGE, signifies the expression of our ideas, and their different relations, by means of articulate sounds.

The acquisition of languages is an object of great importance. Without entering into a discussion concerning their origin, we shall briefly observe, that the power of speech is not naturally acquired; because, when considering its mechanism, certain positions and motions of the organs of the mouth, such as the tongue, the teeth, lips, and palate, &c. are necessary for uttering sounds, which cannot be imitated by persons living in a state of Nature, and must, therefore, be the effect of *art*. Hence civil society alone could produce a language; and, as the former is not from Nature, or coeval with the animal, it follows that both must have had a beginning.

The same cause that first produced ideas, and made men rational creatures, also rendered them social or political, and in process of time produced all the arts of life: this cause, is no other than the *necessities* of human life. These are either the want of subsistence, or of defence against superior force and violence; so that without the operation of one or other of these causes, there never would have been society, language, or arts, among men.

The most easy and correct method of acquiring languages, is, however, of greater consequence than the history of their origin. Singular as this assertion may appear to many of our readers, it is nevertheless true, that a just model, or plan of teaching, so useful an art as that of speech, to children or adults, has long been, and still remains, a great *desideratum*. And though we are not in possession of a *perfect* system of grammar, yet many excellent treatises have been written on that subject by ingenious men, who have, *individually*, contributed to render the art of speaking and writing more familiar to persons of ordinary conception.

LANTHORN, or **Lantern**, a well-known contrivance, which serves to carry a candle, without exposing it to the air, or otherwise incurring danger.

Lanthorns are usually made of glass, horn, or other transparent matter, for the transmission of light; but, if they were covered externally with thin wire-work, many accidents might be prevented in stables and barns, as the lanthorns might thus be rendered less liable to injury from external accidents, while the communication of light would not be impeded.

LAPIDARY, an artificer who cuts precious stones.

There are various machines employed in the cutting of precious stones, according to their quality; the diamond, which is extremely hard, is cut on a wheel of soft steel, turned by a mill, with diamond-dust, tempered with olive-oil, which also serves to polish it.

The oriental ruby, sapphire, and topaz, are cut on a copper wheel with diamond-dust, tempered with olive-oil, and are polished on another copper wheel with tripoli and water. The hyacinth, emerald, amethysts, garnets, agates, and other stones not of an equal degree of hardness with the other, are cut on a leaden wheel with smalt and water, and polished on a tin wheel with tripoli. The turcoise of the old and new rock, girasol, and opal, are cut and polished on a wooden wheel with tripoli also.

LAPWING, or *Tringa Vanellus*, L. a British bird distinguished by its black bill, crown of the head, crest, and throat; red legs, black and white wings and tail: it is above 12 inches in length, and weighs about eight ounces.

The female of this bird constructs her nest with a few bents, and deposits four eggs of an olive shade, spotted with black: these are, on account of their delicacy, much esteemed, and sold by the London poulterers for three shillings and upwards the dozen.

During the winter, lapwings frequent fens and marshy places, where they join in numerous flocks: and, though remarkably shy, are then easily taken in nets similar to those employed for catching ruffs. They are not preserved for fattening, but killed when caught: their flesh is very palatable and nutritious.

LARCH-TREE, or *Pinus Larix*, L. one of the most valuable exotics, which was introduced into Britain from the Alps towards the end of the 17th century, and has been lately cultivated with particular attention.

The larch will grow in any soil, but it flourishes most luxuriantly on cold and gravelly lands, or such as are neither too stiff nor too dry; provided its roots can penetrate through the soil to a sufficient depth. It is propagated from seeds first put in a light earth; and, at the end of two years, the young plants are usually removed to those spots where they are destined to remain. This useful tree should be transplanted immediately after shedding its leaves: during the first four years, it grows slowly, and seldom exceeds three feet in height; but in the course of 20, it will surpass both in length and girth, a fir-tree 40 years old; at the age of 24, it is, in general, from 50 to 60 feet high; and, in 50 or 60 years, it often attains the height of 120.

The most proper season for felling the larch, is in the month of July; because the liquid which oozes from the tree at that time, is speedily changed into a gummy-resinous matter, so that the wood is not drained so much as at other seasons, but hardens, and may thus be sooner employed.

The larch is of singular utility for various purposes, in which durability and strength are required. Hence it is peculiarly calculated for ship-masts and the building of vessels, or for strengthening the wooden frame-work of bridges; for it is capable of supporting a much greater weight than the oak itself, and almost petrifies under water. It also resists the intemperature of our climate, and is of excellent service for gates, pales, and other works which are exposed to all the vicissitudes of the weather.

Larch timber is equally durable within doors; and houses constructed with it, have a whitish cast for the first two or three years; after which the outside becomes black, while all the joints and crevices are firmly closed with the resin extracted from the pores of the wood by the heat of the sun; and which, being hardened by the air, forms a kind of bright varnish, that has an elegant appearance. Nor is there any wood which affords such durable pipe-staves for casks, while the flavour of the wine is at the same time preserved and improved. Its trunk, when perforated and *tapped* between the months of March and September, yields the purest *Venetian turpentine*, that is of considerable use in medicine. Its large branches produce small sweetish grains, resembling sugar; and which are known under the name of *manna*, from their possessing similar purgative properties with that drug.

The larch is likewise an excellent nurse to the more tender trees; as it is furnished with several small, pliant branches abounding with leaves; which, from their flexibility, readily yield to the contiguous trees, admit rain more easily than Scotch firs, and receive no injury from inclement snowy winters; when the branches of the latter are frequently stunted, and the trees themselves totally destroyed.

Beside the manifold uses to which this inestimable tree is subservient, we shall mention a few additional facts, chiefly extracted from foreign writers, with the confident hope of promoting its more general culture. From the inner rind or bark of the larch, the Russians manufacture fine white *gloves*, not inferior to those made of the most delicate *chamois*, while they are stronger, cooler, and more pleasant for wearing in the summer. A gummy matter, partaking of the properties of animal glue, and vegetable mucilage, is obtained by a curious process from the sap of this tree; and which greatly resembles the gum arabic of Senegal, though it is of a brown colour; it is known in Russia by the name of *Oremberg Gum*. PALLAS informs us, that the untutored natives cut a hole at one side of the trunk, near its root, then burn the wood to the very pith, by applying combustible materials: in consequence of the heat thus generated, the circulating medullary juice descends in drops, which concrete into a transparent gum, forming various fanciful configurations. In countries where the larch-tree abounds, its firm and compact wood (a cubic foot of which, or 144 solid inches, weighs 41 pounds, and exceeds that of the fir in the proportion of 8 to 7), affords a very superior charcoal: this, likewise, in quantity, measured one-third more than that burnt from the fir-tree; and its specific gravity, on weighing and balancing it with the latter, was as 8 to 5. It is, however, remarkable, that the larch contains more aqueous ingredients than the fir-tree, insomuch that five measures of the oily water collected during the combustion of the former, yielded, on evaporation, only 3½ ounces of pitch; whereas four and a half measures of the latter, produced 4 ounces. Buildings erected of larch wood, have been observed to remain sound for 200 years; as it is eminently adapted to resist the effects of air and water, while it is exempt from the depredations of the worm; hence it is peculiarly excellent for shingles; but, on account of its combustible nature, it would be advisable to prepare them in the manner directed by Mr. Knox, in the 23d vol. of *Annals of Agriculture*. Lastly, the bark and other parts of this profitable tree, have been found, by experiment, to be proper substitutes for that of the oak.

The fullest account of the numerous good qualities of the larch, is to be found in Dr. Anderson's *Rural Essays*.

LARK, or *Alauda*, L. a genus of birds comprising twenty-eight species, of which the most remarkable are:

1. The *arvensis*, or Common Sky-lark; a long-lived and hardy bird, mounting high, raising its notes as it soars, and lowering them as it descends. It is remarkable that this, and the following species, are the only known creatures that sing during their flight. The female sky-lark constructs her nests in fields productive of high grass, or in marshes, on the ground, beneath some clod; forming it of hay, dry fibres, &c. she deposits four or five eggs, and produces young ones three, and often four times in a year. In the neighbourhood of Dunstable, England, these birds are taken in great numbers, from the 14th of September to the 25th of February; during which time about 4000 dozens are caught, to supply the markets of London.

2. The *arborea*, or Wood-lark, is distinguished by an annual white fillet about the head. It is of inferior size, and its notes are weaker and less musical. This little warbler, when in the cage, often strives to excel the nightingale; and if not speedily removed from the place where he is suspended, will certainly fall a victim to emulation.

Wood larks perch on trees, and their whistle resembles that of a black-bird; the female builds her nest on the ground, and furnishes it externally with moss, but internally with dried bent grass, &c. She lays five eggs, of a dusky colour, interspersed with deep brown spots. The common food of young larks reared in an aviary, is a hen's egg boiled hard, and chopped or grated very fine, together with the crumb of bread, and hemp-seed; but, if diseased, a few wood-lice may be given them: a little liquorice, and a blade of saffron, may also be infused in their water, which will contribute to their speedy recovery.

Method of catching Larks.—The usual practice of taking these birds is, by *trammels*, or a kind of nets, generally 36 yards in length, and about 6 yards in breadth, having six ribs of pack thread, which are fastened on two poles, about sixteen feet long. After selecting the darkest night for this sport, the net is to be drawn over the ground by two men, who frequently drop it, lest they should pass over the birds; as soon as the latter are perceived to fly up against the trammel, it is instantly clapped down, and thus the larks are secured. This net is also well calculated for catching various other kinds of birds, such as partridges, quails, woodcocks, &c.

LARK-SPUR, or *Delphinium*, L. a genus of plants, consisting of fourteen species, one of which only is indigenous, namely, the *consolida*, or Wild Lark-spur; Field Lark-spur, or Lark's-heel: it grows in corn-fields, and flowers from the month of June to September.

LARVA, in natural history. The larva state of insects, in general, denotes caterpillars of all kinds. The caterpillar state is that through which every butterfly must pass before it arrives at its perfection and beauty. The change from caterpillar to butterfly was long esteemed a sort of metamorphosis, or real change of one animal into another; but this is by no means the case. The egg of a butterfly produces a butterfly, with all the lineaments of its parent; only these are not disclosed at first, but for the greater part of the animal's life they are covered with a sort of case or muscular coat, in which are legs for walking; these only suit it in this state, but its mouth takes in nourishment, which is conveyed to the included animal; and after a proper time this covering is thrown off, and the butterfly, which all the while might be discovered in it by an accurate observer with the help of a microscope, appears in its proper form. The care of all the butterfly tribe to lodge their eggs in safety is surprising. Those whose eggs are to be hatched in a few weeks, and who are to live in the caterpillar state during part of the remaining summer, always lay them on the leaves of such plants as will afford a proper nourishment; but, on the contrary, those whose eggs are to remain unhatched till the following spring, always lay them on the branches of trees and shrubs, and usually are careful to select such places as are least exposed to the rigour of the ensuing season, and frequently cover them from it in an artful manner.

LATH, in building, a long, thin, narrow slip of wood, which is nailed on the rafters of a roof, in order to support its covering.

Laths are divided into three classes, according as they consist of different kinds of wood: viz. 1. Such as are formed of *heart of oak*, and which are used only for tiling; 2. *Sap*; and 3. *Deal-laths*; both of which are employed exclusively for ceiling and making partitions. They are farther distinguished, with respect to their length, into *five-feet*, *four-feet*, and *three feet* laths, though the statute allows only laths of two lengths, namely, those of five and three feet; each of these is directed to be an inch and a half in breadth, and half an inch in thickness. For an excellent method of laying laths, so as to make them *fire-proof*, the reader will consult page 155 of this volume.

Laths are sold by the bundle, which is generally called a hundred; it should be observed, however, that seven score, or 140, are computed in the hundred for three-feet laths; six score, or 120, in such as are four feet in length: and for those which are denominated five-feet, a full hundred or five score.

Method of cleaving Laths. The lath-cleavers having cut their timbers into lengths, they cleave each piece with wedges, into eight, twelve, or sixteen, according to the size of their timber; these pieces are called bolts; this is done by the felt-grain, which is that grain which is seen to run round in rings at the end of a piece of a tree. Thus they are cut out for the breadth of the laths, and this work is called felting. Afterwards they cleave the laths into their proper thicknesses with their chit, by the quarter-grain, which is that which runs in a straight line towards the pith.

LATHE, a very useful engine for turning wood, ivory, metals, and other hard substances.

The invention of this instrument is of great antiquity, for, according to VIRGIL, the ancients availed themselves of it, in forming various kinds of vases, which they enriched with figures and ornaments in basso-relievo It is composed of two wooden cheeks or sides, parallel to the horizon, with a groove between them: perpendicular to these are two other pieces called *puppets*, constructed so as to slide between the cheeks, having two points meeting the opposite central sides or ends of the article intended to be worked, so as to sustain it; thus the piece is turned round in both directions, by means of a cord attached to it, fastened above to the end of a pliable pole, and underneath to a treadle or board, which is moved by the foot. To such apparatus a *rest* is also subjoined, which supports the instrument, and keeps it steady. This useful machine has lately been much improved, and we had an opportunity of comparing a variety of lathes manufactured of steel in the city of London, and designed chiefly for private use and exercise; among which, for neatness and simplicity, we are inclined to give the preference to those contrived by Mr. HOLTZAPFEL, an ingenious young artist, of Long-acre.

With respect to the manner of applying this curious instrument to the various purposes to which it is adapted, we refer the reader to the article TURNING.

LATITUDE, in geography, is the distance of any place from the equator, measured in degrees, minutes, and seconds, upon the meridian of that place: and is either north or south, according as the place is situated either on the north or south side of the equator.

LATTEN, among manufactures, iron plates, tinned over. See TIN.

LAUDANUM. *Tincture of Opium.* The occasions for the use of *Laudanum* in families are so numerous, that the utmost certainty with regard to the dose ought to prevail. This can only be effected by families making this medicine themselves, or by purchasing it of apothecaries of reputation, who will consent to make it agreeably to a prescription given to them. The following is the form prescribed by the *London College of Physicians*:

Purified opium, ten drachms; Proof-Spirit, one pint. Digest for ten days, and then strain.

Dr DONALD MONROE observes, "one drachm (sixty drops) of the above tincture, contains, by experiment, $3\frac{2}{3}$ grains of opium; so that three drachms of it contains eleven grains: hence if we mix eight drachms of proof-spirit, with three drachms of the above tincture of opium, we form a tincture, each drachm of which contains one grain of opium; if we want a still weaker tincture, we may add eleven drachms more of *proof-spirit*, when we shall have a tincture, each drachm of which contains half a grain of opium.

In most cases, however, it will happen, that this medicine must be purchased, as prepared by the apothecary's particular recipe; and therefore to prevent the administration of an over-dose, it should be given in small quantities, (say fifteen drops to a grown person) at a time, until the desired effect be produced. A single full dose of 20, 30, or 35 drops, will frequently disappoint our wishes, by proving either too great, or too small a quantity for the necessities of the system.

Laudanum should always be given in a perfectly bright state; when kept some time it will deposit a portion of what had been previously held in solution; and being solid opium, will greatly increase the strength of the dose. Such thick laudanum should be marked, and reserved for external applications.

LAUGHTER, a sudden and convulsive expression of mirth, peculiar to the countenance of man; and which is occasioned by some object that surprises the fancy.

This emotion, however, more frequently arises from an unexpected disappointment of the mind, while its attention is arrested by an object apparently of great importance; but suddenly terminating in ridicule, or insignificance. With respect to its influence on the body, moderate laughter is very beneficial: for it contributes to promote the circulation of the blood through the lungs, and has frequently removed colics, pains in the stomach, and similar complaints. Various instances have likewise occurred, in which deep-seated ulcers of the lungs and liver, that could not be relieved by any remedies, bursted, and were perfectly cured by a fit of laughter, artificially excited. Beside the pleasing sensations with which it is accompanied, this affection powerfully operates on the organs of digestion, and greatly contributes to the assimilation of food.

Laurel. See Bay-tree.

LAVENDER, or *Lavandula*, L. an exotic genus of plants, comprising seven species; the principal of which is the *spica*, Lavender-spike, or Common Lavender: it flowers in the month of July.

This herb may be easily propagated: in March or April, take a quantity of slips, or cuttings, from three to four inches long; having stripped off the lower leaves, plant them in a shady border four inches apart. If occasionally watered in dry weather, they may be transplanted early in autumn; removing them, if possible, with balls of earth. When they are intended for a crop, it will be requisite to set them in rows two or three feet separate, and at the distance of two feet from each other; but, if destined for the shrubbery, they should be planted singly, at proper distances.

Lavender is employed both for medicinal and domestic purposes. The flowers should be gathered in July, when the spikes being cut off close to the stem, in a dry day, and tied up in bundles, are much esteemed, not only for their grateful odour, when deposited in chests, or boxes, among linen, but chiefly for preventing the depredations of *moths* and other insects. By distilling these flowers, they yield a compound spirit, which is of considerable service in palsies, vertigoes, lethargies, tremors, &c. The distilled oil possesses the power of destroying the *pediculi inguinales*, and other cutaneous vermin. If soft, spongy paper be dipped in this oil, and applied at night to the parts infested with the insects, they will, according to Geoffroy, be found dead in the morning.

LAVENDER-THRIFT, or Sea Lavender, *Statice Limonium*, L. an indigenous perennial plant, growing on the sea shore; in salt marshes; and the fissures or clefts of rocks, near the sea coast; it is in flower from July to September.

This vegetable deserves the attention of tanners, on account of its red, astringent root, called, by the Russians, *Kermek*; and from which they prepare that valuable kind of leather distinguished by its peculiarly strong, though not ungrateful odour, and on the continent of Europe termed *Juften*. Guldenstaedt, in his *Travels through Russia*, observes, that on the coast near Azof, he met with a tan-work in which the root of the Sea-Lavender was employed in dressing the hides of oxen, both for the celebrated Russia, and common soal-leather. The roots are previously dried in the sun, and finely pulverised: next, the hides are cleaned with ashes obtained from the roots of the oak, and suffered to lie a month in this preparatory lixivium; after which they are immersed into the liquor made of the pounded roots before mentioned. He adds, that there is not the least doubt of this root proving a complete substitute for the more expensive oak-bark.

LAW, a rule of action: whether the action be performed by a thing animate or inanimate: thus, we say, *law of gravity* as well as *law of nations*. The first division, therefore, of the compound idea of law, is into I. *mechanical law*, and II. *moral law*; the first comprehending the irresistible ordinations of nature; the second, prescriptions, in cases where several modes of action are equally possible.

I. The first class of laws are the objects of *physics*.

II. The second comprehends what is commonly called law; that is, the rule of moral conduct.

Laws are subdivided into several orders: 1. ethics, or the law of nature; 2. divine law, or the law of revelation; 3. law of nations; 4. municipal law.

1. The "law of nature," otherwise called ethics, or morals, comprehends those rules of right and wrong, of which the sentiment is in every man's breast, and of the justice of which reflection affords sufficient conviction.

2. The divine, or revealed law, is that which, not being naturally felt, nor discovered by reflection, is found only in inspired writings.

3. "The law of nations" is that rule of conduct which nations are to observe toward each other. This is founded upon the law of nature; but either ascertained or modified by usage, or by mutual compacts.

4. "Municipal law" is, again, that which is most usually spoken of under the simple term of *law*. It includes whatever belongs to the internal government of a nation. Municipal law is either *criminal* or *civil*; *criminal*, wherein it prescribes punishments for offenders; *civil*, wherein it prescribes rules for determining disputes on property. Municipal law also comprehends several inferior branches, adapted to specific occasions. The term is, also, occasionally confined to the peculiar laws of a single city; and this is its original meaning.

Law, to be just, must be prescribed; that is, it must be fixed, and published, before the act to which it relates has taken place.

Municipal law of England. A body of law, divided into various parts, according to the foundations upon which it stands, or the affairs it is adapted to regulate.

1. Of these parts, the first is the common law.

2. The second, the statute, or written law, or that which is ordained by the statutes of the king and parliament.

3. The third, the civil law.

Within these three sections are comprised the subdivisions of crown-law; ecclesiastical, or canon, law; forest-law; the law of marque and reprisals; the law of merchants; martial-law; &c.

LAWYER, a general term for persons conversant in the law; including attorneys and solicitors, who conduct suits; counsellors, who give advice; barristers, who plead at the bar; serjeants, a superior order of barristers; and judges, who preside on the bench.

LAXATIVES, or APERIENT MEDICINES, are such as promote a loose state or disposition of the bowels, for the more easy and regular evacuation of the feces. On account of the gradual effect which laxatives produce on the body, they are distinguished from the more powerful or drastic purges, which operate more speedily. Hence, with the former intention, castor-oil, or cold-drawn linseed oil, are alike calculated to afford relief, especially if they be taken in small doses, such as a table-spoonful every hour, with a draught of warm ale, till they mildly operate. As, however, the difference between these, and the more brisk cathartics, greatly depends on the manner of administering them, we shall communicate a few observations on both, under the article PURGATIVES.

LAYERS, in horticulture, denote certain tender shoots or sprigs of trees, which are buried or deposited in the ground, till they have taken root; when they are separated from the parent stock, and become distinct plants.

The method of propagating trees by layers, is performed in the following manner: A small cut or slit is first to be made in the branches, which should then be laid about half a foot deep, in light, rich mould, and gently watered; but if they do not retain the position in which they were placed, it will be necessary to fasten them down with wooden hooks.

The best season for propagating layers is, for evergreens, towards the end of August; and for deciduous trees, in the beginning of February: after having taken root, they may be separated from the parent stock, and planted out in the succeeding winter. Some horticulturists, however, recommend stripping off the rind or bark; others direct the branch to be twisted, previously to setting it in the ground; but these operations are not essentially requisite, as the layers will flourish, if proper attention be paid to water them regularly during their early growth.

A better way is to inclose a branch in a flower-pot or keg divided and filled with earth, having previously made a circular incision through the bark of the branch down to the wood. The keg or pot must be supported by a frame, and may be thus watered at pleasure, and preserved from that decay which frequently attend layers in the earth. A bearing branch of a fruit tree, it is said, will thus be brought to produce fruit in one year. See article FRUIT.

LAYMAN, in law, every one who is not an ecclesiastic.

LEAD, in mineralogy, a metal usually found combined with other substances, but which has been met with in a native state in Monmouthshire, in Wales, and in more than one part of France.

Lead, which is of a dull white colour, inclining to blue, is very malleable, but imperfectly ductile; a wire formed of it, the tenth of an inch in diameter, not being able to sustain a weight exceeding twenty-nine pounds and a half.

Lead, while in the earth, enters into the substance of crystal. This is frequently the case with that crystal which is found about lead-mines, the figure of which it renders a cube. It often does this without altering the colour; but when it tinges likewise, the tint it gives is yellow.

The topaz, among the gems, owes its yellow colour to this metal; and, in the factitious gems, the tint it gives to the composition is always a yellow approaching to that of the topaz.

Lead ore is readily known to be such, by its being nearly of the colour of lead itself, or a little darker; very bright and glossy when fresh broken; and composed either of cubic or parallelopiped masses, or of smaller granules, or else of striæ, or chamfered, or furrowed, pieces: in the first of these states it is commonly called porter's-ore, or diced lead-ore; in the second, steel-grained-ore; and in the third, antimoniated-ore, from its resemblance to antimony.

Lead is employed in making various vessels, such as cisterns for water, large boilers for chemical purposes, &c. Considerable quantities are likewise used in the casting of shot, for which a patent was granted in 1782, to Mr. WILLIAM WATTS, in consequence of his invention for granulating lead solid throughout, without those imperfections which other kinds of shot usually present on their surface. The patentee directs 20 cwt. of soft *pig-lead* to be melted in an iron pot, round the edge of which, a peck of coal-ashes is to be strewed upon the surface of the metal, so as to leave the middle of the latter exposed. Forty pounds of *arsenic* are next to be added to the uncovered lead, and the pot closely shut; the edges of the lid being carefully luted with mortar, clay, or other cement, in order to prevent the evaporation of the arsenic. A brisk fire is then kindled, so that the two substances may be properly incorporated; when the metal ought to be skimmed and laded into moulds, that it may cool in the form of ingots or bars, which, when cold, are called *slag*, or poisoned metal—20 cwt. of soft pig-lead, (according to the quantity of shot intended to be manufactured) are next to be melted in the manner above directed; and, when it is completely liquefied, one of the ingots or bars of slag must be added: as soon as the whole is combined, a small quantity of the liquid metal is to be taken out with a ladle, and dropped from a height of about two feet into the water. If the shot be not perfectly round, it will be necessary to add more slag, till it drops in a globular form. The metal is next skimmed, and the scum poured into an iron or copper frame perforated with round holes, according to the size of the shot designed; the scum is then to be squeezed while soft, through the frame, into which the liquid should be poured, and dropped through the holes. For the smallest shot, the frame must be at least ten feet above the water, and for the largest, about 150 feet; the height being increased or diminished, in proportion to the size of the shot.

There are various other purposes to which lead is usefully applied: it unites with almost every metal, except iron; but, if both metals be exposed to the fire in a proper vessel, the former scorifies the latter, and melts with the calx into a dark coloured glass. On account of this property of vitrifying the imperfect metals, lead is often used in the purification of gold and silver, neither of which combine with it, but remain pure on the bottom of the cupel. It is also frequently employed by unprincipled dealers, for correcting the rancidity of damaged rape seed oils, and those of almonds or olives. This dangerous abuse may be discovered, by mixing a small quantity of the suspected oil with a solution of orpiment, or liver of sulphur, in lime-water: as, on shaking the two liquids together, and suffering them to subside, the oil will, if it be adulterated with lead, acquire an orange-red colour; but, if it be pure, it will assume only a pale yellowish shade. A similar pernicious fraud is practised with acid wines, which dissolve a sufficient portion of lead, so as to acquire a sweetish taste: this may be detected by means of the same solution, which forms the chief ingredient of the different liquid tests sold for that purpose.

Lead, when taken or inhaled into the human body, is productive of various fatal disorders, to which miners, potters, and all other persons concerned in its manufacture, are peculiarly subject. Hence, culinary vessels, or other domestic utensils made of this metal, are highly objectionable, especially if they are intended to contain cyder or other acid liquor. To this cause the *Devonshire colic* is justly attributed; for great quantities of cyder are, in that country, kept in vessels, consisting either wholly of lead, or such as are soldered with this pernicious metal. The *dry belly-ach* of the West-Indies is of the same origin, and is occasioned by distilling rum through leaden worms.

In these dreadful complaints, the patient is seized with an acute spasmodic pain in the stomach, which extends gradually to the whole intestinal canal: the bowels are frequently inverted and drawn towards the spine, so as to render the application of clysters impracticable. At the same time, a most obstinate costiveness prevails; and the affection at length terminates in palsy, or in fixed contractions of the limbs.

For the cure of this painful malady, gentle clysters and laxatives may at first be administered; but, if these are not attended with beneficial consequences, Dr. Percival decidedly recommends the internal use of *alum*; which, in slight cases of the Devonshire colic, has generally effected a cure, when used to the extent of fifteen or twenty grains every fourth, fifth, or sixth hour. Balsam of Peru, in doses of forty drops, to be taken two or three times in the course of the day, has also been advantageously prescribed; at the same time, castor-oil, or other mild laxatives, conjoined with gentle opiates, have greatly contributed to afford relief. The patient's diet ought to consist of nourishing broths, panada, and gruel, or similar light dishes.

In whatever form lead may be introduced into the human body, it is equally deleterious and fatal, whether its vapours be inhaled through the lungs, absorbed through the pores of the skin, or particles of the metal be taken into the stomach. The only effectual antidotes to this insidious poison are, antimonial emetics; and, after them, the internal use of liver of sulphur, together with vegetable oils, both externally and internally, should be liberally continued.

Red-lead, or *Minium*, is a calx of lead of a lively red colour, which it acquires by slow calcination and reverberation. Its preparation is as follows: A quantity of lead is first burnt in a furnace, till it is converted into a kind of litharge, being stirred continually with an iron spatula, while it is melting: it is then ground in a mill to a fine powder, after which it is again put into the furnace and stirred as before, when it assumes first a blackish hue, then a yellow cast, and at length becomes of a deep red colour. While this operation is performing, the greatest caution is requisite to keep the fire at a certain height, in order to prevent the matter from adhering, and running together.

The bright colour of minium would render it a valuable pigment, if it could *stand* either in oil or in water: but, being apt to become black, it is seldom employed, except as a ground for vermilion. The genuine quality of red-lead may be ascertained by the brightness of its colour; and, as it is frequently adulterated, such fraud may be easily detected, by mixing equal quantities of minium and charcoal-dust in a crucible, and placing the whole over a fire sufficiently intense to melt lead. When it has continued for some time over the flame, it must be removed; and, when cold, stricken against the ground. Thus, the red-lead will be reduced to its metallic state; and, when freed from the charcoal, its diminished weight will shew the proportion of adulterated matter.

In medicine, red-lead is only employed externally: it obtunds the acrimony of humours; mitigates inflammations; and, if judiciously applied, is of excellent service in cleansing and healing old ulcers.

White-lead, or *Cerusse*, is prepared by placing a vessel containing vinegar in a moderately warm place, and over which thin plates of lead are suspended, so that the vapour arising from the acid may circulate freely round the plates. A white powder settles in the course of two or three weeks, on the surface of the metal, which is now removed into another room, and passed beneath a screen, and pair of rollers, for separating the corroded from the sound part; that is again suspended, till it is wholly converted into a white calx; when it is called cerusse, or white-lead.

[It may also be made by precipitating a solution of litharge in vinegar, by a stream of carbonic acid gas: also by grinding litharge with common salt; the alkali of soda is disengaged, which after some days' exposure to the air acquires carbonic acid, and in its turn again decomposes the muriate of lead. The old way is the safest as yet.—T. C.]

All the different methods of preparing white-lead, however, are extremely pernicious, as well to the manufacturer as to those who use vessels that are glazed with it. Hence we have already, under article **Glazing**, pointed out proper substitutes for this destructive metal, which were invented by foreign chemists; and shall, therefore, conclude with an account of the patent granted in 1796 to Mr. **James Keeling**, for his contrivance of a substitute, both for red and white-lead, in glazing earthen wares, glass, enamel, &c. He directs any quantity of lead ore, to be put into a reverberatory or other furnace, and to be roasted till it become of a *white-heat*, during which process the metal will emit a considerable portion of fumes. The fire must be continued till about an hour after the vapour is dissipated; and, when the mass grows cool, it is to be removed from the furnace, and ground with water to a fine liquid state, when the other ingredients, usually employed in making *glazes*, may be added; and the preparation will be complete. Thus the injuries occasioned to the workmen, by the dusty particles which settle upon their skin and lungs, will be effectually prevented; but this *succedaneum* does not remove the poisonous qualities of the metal in the glazing of earthen-ware.

White-lead is employed in painting, and furnishes a tolerable white. See articles **Colour** and **Paint**.

Cerusse is likewise used in surgery; and, on account of its cooling, drying, and astringent properties, is of considerable service when sprinkled over running sores or ulcers.

[*Chromat of Lead.*—Take the chromat of iron, which is found in the steatite and serpentine formation in a south-east line from Connecticut to the southern states. Grind it to a powder, which can be done for about a cent a pound: add to it half its weight of common nitre, and mixing the ingredients well, expose them for two hours to a strong heat in an iron pot. Take out the materials, wash them, filtre the liquor which is partly alkaline, and partly chromat of potash. Saturate the alkaline part with any acid, and with this liquor precipitate a solution of acetate of lead. A yellow powder will fall down, which is the chromat of lead.—T. C.]

Black-Lead, or *Plumbago*, a genus of inflammable substances, found in various parts of the world; but most abundantly at Borrowdale, in Cumberland; whence Britain, as well as the greater part of Europe, are supplied with this article.

Pure black-lead is of a very deep colour: when newly cut, it presents a bluish-white cast, and shines like common lead. It is insoluble in acids; but, if it be put into a vessel placed over a strong fire, and exposed at the same time to the air, it is almost entirely volatilised, depositing only a little iron, and a small portion of siliceous earth.

Black-lead is chiefly used in the manufacture of pencils for drawing; and though paper can be marked with them for a time, yet every trace may afterwards be totally rubbed out by means of soft bread, or elastic gum. In forming such pencils, the lead is divided into long pieces, and fixed into square grooves, cut in cedar or other soft wood: another piece is then glued over, and the whole worked into thin cylinders. A coarser kind of pencils is manufactured, by mixing pulverised black-lead with sulphur; which, however, are calculated only for carpenters' marks, or very coarse drawings. The powder of black-lead also serves to cover razor-straps; and considerable quantities of it are used for imparting a bright gloss to cast-iron grates or stoves. It may also be advantageously applied to smoothen the inner surface of wooden screws, packing-presses, and other wood-work that is subject to frequent friction, for which purpose it is far superior to greasy, soapy, or oily matters.

[Black-lead is found in Connecticut, in Morris county, New-Jersey, and very fine about four miles from Bustleton, and about thirteen from Philadelphia. —T. C.]

LEAD-WORT, or *Plumbago*, L. a genus of exotic plants, consisting of four species; the most remarkable of which is the *Europæa*: its root is perennial, strikes deep into the ground, and grows naturally in the southern parts of Europe.

This very acrid and poisonous vegetable may be propagated either by parting the roots, or by the seeds; as it will grow in the open air of our climate, and is far from being an useless plant. Its root was formerly kept in the shops, and is still occasionally employed for drawing blisters, and exciting salivation.

LEAF, a distemper incident to lambs, when about a week or fortnight old. It has received this appellation, as the creatures feed on oak and hawthorn leaves, which cause them to foam at the mouth, reel and stagger, so that they suddenly drop down and expire.

Although we are not acquainted with any certain remedy for this malady, yet we believe it may be cured in its early stages, by giving the young animals thus injured, a mixture of equal parts of oil and vinegar, in frequent small draughts poured into the throat, and at the same time administering clysters composed of similar ingredients.

LEAP YEAR. The same with bissextile year. See YEAR.

LEASE, in law, an instrument or agreement, by which, under certain conditions, and particularly the payment of a rent, lands, tenements, or hereditaments are let, by the lessor, to the lessee, for a specified time. The time may be either positive or conditional, that is, for a year or certain number of years; or for the space of the life of some one person, or more. Any one of the conditions of a lease not being complied with, the proprietor may re-assume possession.

The purchaser of a lease may be considered as the purchaser of an annuity equal to the rack-rent, for whether he possesses the estate himself, or lets it out to another, he has an interest in the same equal to the annual rent thereof, therefore, from the principles, on which the present value of annuities is ascertained, the value of leases is likewise found. When a certain sum is paid down for the grant of a lease, it may be considered as so much money paid in advance for the annual rents as they may become due; therefore, in order to ascertain what the sum ought to be, it would be necessary to find, separately, the present value of each annual rent, or the sum which, put out to interest at the given rate, would amount to the rent at the time it became due; and these separate values of each year's rent added together would give the sum to be paid down as the present value of the lease. The rate of interest at which money is supposed to be improveable, affects the value of leases very materially, as the higher the current rate of interest is, the less will any one be disposed to give for payments to be received at future periods: thus, if 6 per cent. interest can be readily obtained for money, no one will give the same sum for a certain yearly rent as if he could only make 4 per cent. interest of his money. The value of leases at 5 per cent. is found by the table given in Compound INTEREST, thus: the value of a lease for fourteen years of a farm worth 300*l.* per annum, is by that table 9·898 × 300 = 2969·4 = 2969*l.* 8*s.*

Leases are generally calculated at a higher rate of interest, we shall therefore insert the following

TABLE, shewing the number of years purchase that ought to be given for a lease, for any number of years, not exceeding 100, at 6 and 8 per cent. interest.

Years	6 Per Ct.	8 per Ct	Years	6 Per Ct.	8 Per Ct	Years	6 Per Ct.	8 Per Ct.
1	.943	.925	35	14.498	11.654	68	16.349	12.433
2	1.833	1.783	36	14.620	11.717	69	16.367	12.438
3	2.673	2.577	37	14.736	11.775	70	16.384	12.442
4	3.465	3.312	38	14.846	11.828	71	16.400	12.447
5	4.212	3.992	39	14.949	11.878	72	16.415	12.450
6	4.917	4.622	40	15.046	11.924	73	16.429	12.454
7	5.582	5.206	41	15.138	11.967	74	16.443	12.457
8	6.209	5.746	42	15.224	12.006	75	16.455	12.461
9	6.801	6.246	43	15.306	12.043	76	16.467	12.463
10	7.360	6.710	44	15.383	12.077	77	16.479	12.466
11	7.886	7.138	45	15.455	12.108	78	16.489	12.469
12	8.383	7.536	46	15.524	12.137	79	16.499	12.471
13	8.852	7.903	47	15.589	12.164	80	16.509	12.473
14	9.294	8.244	48	15.650	12.189	81	16.518	12.475
15	9.712	8.559	49	15.707	12.212	82	16.526	12.477
16	10.105	8.851	50	15.761	12.233	83	16.534	12.478
17	10.477	9.121	51	15.813	12.253	84	16.541	12.480
18	10.827	9.371	52	15.861	12.271	85	16.548	12.481
19	11.158	9.603	53	15.906	12.288	86	16.555	12.483
20	11.469	9.818	54	15.949	12.304	87	16.561	12.484
21	11.764	10.016	55	15.990	12.318	88	16.567	12.485
22	12.041	10.200	56	16.028	12.332	89	16.573	12.486
23	12.303	10.371	57	16.064	12.344	90	16.578	12.487
24	12.550	10.528	58	16.098	12.356	91	16.583	12.488
25	12.783	10.674	59	16.131	12.366	92	16.588	12.489
26	13.003	10.809	60	16.161	12.376	93	16.592	12.490
27	13.210	10.935	61	16.190	12.385	94	16.596	12.490
28	13.406	11.051	62	16.217	12.394	95	16.600	12.491
29	13.590	11.158	63	16.242	12.402	96	16.604	12.492
30	13.764	11.257	64	16.266	12.409	97	16.608	12.492
31	13.929	11.349	65	16.289	12.415	98	16.611	12.493
32	14.084	11.434	66	16.310	12.422	99	16.614	12.493
33	14.230	11.513	67	16.330	12.427	100	16.617	12.494
34	14.368	11.586						

To find the sum that ought to be given for a lease.

Rule Look in the table against the number of years for which the lease is to continue, and on the line even with it, under the given rate of interest, is the number of years purchase that ought to be given for the same.

Ex. What sum ought to be given for the lease of an estate of 17 years, of the clear annual rent of 75*l.*, allowing the purchaser to make 6 per cent. interest of his money?

Answer, 10·477 × 75 = 785*l.* 15*s.* 6*d.*

This sum of 785*l.* 15*s.* 6*d.* put out to compound interest, at the rate of 6 per cent., will produce a clear income of 75*l.* per annum for 17 years: consequently, if it be agreed that 6 per cent. is the proper interest, then the landlord has a full equivalent for his grant.

To find the annual rent corresponding to any given sum paid for a lease.

Rule. Divide the sum paid for the lease by the number of years purchase that are found against the given term, and under the rate of interest intended to be made of the purchase money, the quotient will be the annual rent required.

Ex. I am asked 1500*l.* for a 40 years lease, to what annual rent is that equivalent, allowing 6 per cent. for money?

Answer, $\frac{1500}{15{\cdot}046}$ = 99*l.* 13*s.* 11*d.*

To find the number of years purchase given for a lease that cost a certain sum of money.

Rule. Divide the sum paid for the lease by the clear annual rent of the estate for which it is given, and the quotient will be the number of years purchase required.

Ex. The lease of a house, at the clear annual rent of 116*l.* was sold for 1630*l.*, what number of years purchase was given for it?

$\frac{1630}{116}$ = 14 yrs. 0 mo. 2 weeks, 4 days.

LEATHER, the skins of various quadrupeds dressed in a particular manner, for the use of manufactures. See CURRYING and TANNING.

White Japan for Leather. Carb. barytes precipitated by sub. carb. amm. in cop. varnish.

Yellow. Dye with yellow berries and weld. Cop. varnish.

Red. Madder lake. Cop. varnish.

Blue. Pruss. blue.

Dyeing of Leather. Different colours may be imparted to leather, according to the uses for which it is designed. Thus, a *blue* is given by immersing the piece for the space of twenty-four hours in urine and indigo, after which it is boiled in alum; or this colour may be communicated by tempering the indigo with red wine, and steeping the skins in the mixture.

A *red* colour is obtained, by first washing the skins, which are then soaked for the space of two hours in galls, wrung out, and immersed in a liquor prepared by a solution of privet (*Ligustrum vulgare*, L.), alum, and verdigris in water; when they are steeped in a dye made of Brazil-wood boiled with ley. In order to communicate a *purple*, the skins are wetted with a solution of Roman alum in warm water; and when dry, they are rubbed by the hand with a decoction of log-wood in cold water.

Leather acquires a *light-green* tinge, by applying to it sap-green diluted with boiled alum-water: a *dark-green* cast is communicated by means of steel filings and sal ammoniac, steeped in urine for a considerable time, and well rubbed into the skin, which is then to be dried in the shade.

A *yellow* colour is given, by anointing the skin with a decoction of aloes and linseed oil, previously strained; or, by immersing it in a solution of dyer's-green weed. Lastly, if fustic-berries be boiled in alum-water, and the skins dipped in the liquor, they will acquire a *light orange* shade; but, if a deeper hue be required, it will be necessary to substitute turmeric for the berries. For an account of the preparation of red, yellow, or other *Turkey leather*, we refer the reader to the article MOROCCO.

Leather being an article of extensive utility, especially for shoes and boots, various processes have been contrived for rendering it *water-proof;* we have already stated a simple method to this effect (vol. i. article BOOT); and, that our readers may become fully acquainted, with this interesting branch of economy, we shall now give a supplementary account of the different preparations, &c. invented for that purpose.

A patent was granted in 1794, to Mr. JOHN BELLAMY, for his new invented method of making all kinds of leather water-proof. For this purpose, the patentee has contrived two compositions, which are prepared in the following manner:

First method: One gallon of nut-oil, and an equal quantity of poppy-oil, are to be mixed with three gallons of linseed-oil; or, one gallon of nut, or poppy-oil, may be added to three of that expressed from linseed: or, two gallons of the latter may be combined with one pint of nut, and a similar quantity of poppy-oil. These ingredients (in the proportions above mentioned, or such as the nature of the oil may require) are to be poured together in an iron pot, and placed over a gentle fire: to each gallon of oil must be allowed one pound of white copperas, sugar of lead, colcothar, or any other drying substance. The whole is to remain for the space of six or seven hours over such a degree of heat, as it will bear without rising, till it become sufficiently dry; when it may be taken off; and, as soon as it is cool, the compound will be fit for use.

Second method: Gum resin, one pound; pitch, half a pound; tar and turpentine, of each four ounces, are to be added to one gallon of the oils prepared according to the first method: these ingredients are to be well mixed with the oils, first by gently heating the whole mass, then increasing the fire, till the whole become thoroughly incorporated. The patentee specifies various proportions, in which the ingredients may be used; but experience will be the best guide to ascertain them.

When the oils, prepared conformably to the first method, or the gums, &c. according to the second, are sufficiently cool, Mr. BELLAMY directs a brush to be dipped in the preparation, which should be rubbed into the leather. As soon as that article is thoroughly impregnated, it ought to be laid on an even board, and the superfluous matter removed from its surface. With respect to sole leather, or similar thick substances, he observes, that they should first be gently warmed; the composition is then to be applied till they are fully saturated; and, after being properly dried in a warm place, they will be ready for use.

LEAVEN, strictly signifies *sour dough*, which acquires its acidity, when preserved after kneading flour with yeast, in order to ferment a larger quantity of paste. It is a very imperfect substitute for *yeast;* and, as it communicates to the bread an acid taste which few persons relish, it ought to be used only where barm cannot be procured. As, however, the latter ferment is sometimes difficult to be obtained, especially during the winter, we shall communicate the most simple methods of preparing as well as of preserving it, under the article Yeast.

LEAVES, in botany, are defined by Linnæus to be the organs of motion, or muscles of a plant: according to Dr. Darwin, they constitute the lungs of of each individual bud. See Bud.

Leaves are of a deeper green colour than the foot-stalks on which they stand; being formed by the expansion of the vessels of such stalks that produce several ramifications; mutually intersecting each other, and thus making a kind of net: the meshes of which are filled up with a tender porous substance, variously called the *pulp, pith*, or *parenchyma*. This net is provided, chiefly on the surface of the leaf, with a great number of porous or absorbent vessels, which are destined to imbibe the humidity of the air. The upper surface serves as a defence to the lower; and so essential is this disposition to the vegetable economy, that, if a branch be inverted so as to destroy the natural direction of the leaves, these in a short time will spontaneously resume their former position.

Leaves, therefore, are not merely ornamental to plants, but contribute in a very considerable degree to promote vegetation: thus almost every class of the vegetable creation is furnished with them, excepting mushrooms, and one or two other productions of the earth. Indeed, if any tree be deprived of its leaves, it cannot shoot vigorously; and if it be totally divested of them, it speedily perishes. When, however, vegetation ceases, these organs of respiration and inspiration become superfluous: hence there are but few plants furnished with leaves throughout the whole year; the greater part is entirely deprived of them, and remains naked during the winter, producing new foliage with each returning spring.

LEECH, or *Hirudo*, L. a genus of insects comprising several species; the most remarkable of which are:

1. The *medicinalis*, or Medicinal Leech, from three to four inches in length; its body is of a dark brown colour, with six yellow spots on the back; and a similar yellow line on each side; (though, in some seasons, these distinguishing marks are rather imperfect, and almost totally disappear): its head is smaller than the tail, and adheres very firmly. This species is viviparous, inhabits clear running waters, produces in July only one young insect at a time, and is valued for its use in drawing blood.

2. The *sanguifuga*, or Horse-Leech, which inhabits stagnant waters, and is larger than the preceding; its skin is smooth and glossy; the body is depressed; the back is of a dusky colour; and the belly of a light green, with a yellow lateral margin.

3. The *geometra*, or Geometrical Leech, is only 1½ inch long, and has a smooth, glossy skin, of a dusky brown colour, but in some seasons is greenish, spotted with white. When in motion, its back is elevated, so as to form a kind of ridge, and it then appears to measure the space it passes over, like a compass; its tail is remarkably broad, and the insect holds as firmly by it, as by the head. This species is commonly found attached to stones in shallow running waters; and it likewise fastens itself on trout and other fish, after the spawning season.

Observations on Leeches and their use.—The general demand for these useful reptiles, and the high price at which they are sold, induce us to give some particulars, on taking, preserving and applying them, from a person who has attended to this business.

The large brown leech is the only kind in use; they are in general from 2 inches to 6 in length, though they are capable of much greater extension and contraction; sometimes they are seen darting through the water with great swiftness, at which time they are very long, at other times they will contract themselves in a form almost round. They are much rounder in body than the horse-leech (which, contrary to common report will not fasten to the human body), with a degree of taper towards each end. The colour is black, and brown stripes on their backs; the belly is covered with dark brown, interspersed with light brown spots. The method of catching them usually employed in England, is agitating the waters where they are contained, which occasions them to float upon the surface thereof, when, with a net made for the purpose, they are secured. Other methods are employed which would be tedious and unnecessary to relate. They are viviparous, bringing forth their young with all their power, capable of acting in every respect in which this animal is distinguished. The time of fecundity is in the months of April, and May, the latter end of August and September;—the number of young ones a single leech brings forth in one year can hardly be ascertained, though it is very numerous; for when the leech catchers rob a pond of all large enough for use, if nothing happens to obstruct fecundation, in two years afterwards they will find it largely stored with abundance of fine leeches, and a much increased number of small ones; this is particularly found to be the case, from the method which some country people have adopted to obtain leeches as an exclusive property. In order to this, they make a pond, near their house, about 3 feet deep, 20 wide, and 30 long; if they cannot conveniently form one with a sandy bottom they make the pond a little deeper, in which they deposit a few loads of sandy earth. In this pond, when filled with water, they put their leeches about April, and without any further trouble or expense, they obtain, at the proper season, a large supply of leeches.

Leeches may, with care, be preserved healthy and good for years in pans; during the summer season not more than 200 should be kept together, in winter double that number with equal propriety. The vessel they are kept in should be an earthen pan that will contain about 3 gallons of water; for I have found, by experience that it is congenial to their nature to have a place out of the water, which they may retreat to at pleasure; this is proved by their often hanging in clusters round the top of the pan. From May till September their water should be changed, at least, every other day. The best water to keep them in is spring water, as being least disposed to putrescency. I have of late put a little moss amongst leeches, which practice I would recommend, for they are very much enamoured with it, perhaps from its resembling, in some measure, their native weeds; they creep through it, and by that means clean themselves of slime, which in the warm weather accumulates around them, and unless removed by timely changes of water, will be productive of disease. During hot weather they should be kept in as cool a place as possible; and in the winter season place them where the water may preserve that degree of warmth it possesses in summer. When you put fresh water to them during the cold weather, it should be deprived of that intense coldness which it possesses at that season of the year, by warming it in the smallest degree. The leech, as has before been said, feeds upon insects in its native waters, but may be, as hinted, kept in only water for years, though they dwindle by keeping; they remain healthy, and will take with as much avidity as those recently taken from the water, provided they are well attended to, with respect to changing their water agreeably to the rules laid down.

The mode which I have found, by copious experience, to be infinitely the best; (being attended with quickness, certainty, and efficacy) is as follows: Let the part be carefully washed clean with warm milk and water; if very dirty and requires it, a little soap may be used; when the part is thus washed and wiped dry, rub over the part a little milk, then see that your leech is wiped dry with a smooth cloth, which being done, take it with your fingers by the middle, and apply its mouth to the very spot you wish; you will, perhaps, find it, at first, twist and extend itself in your fingers, and then wish to attract itself to some contrary part; but as repeatedly as it extends itself around, or attempts to fix upon a wrong situation, you must as repeatedly draw it back, and re-apply it, to the proper part; by so doing you will find it will presently seize the precise spot wished for; when you find this you must not hastily let the leech go, for they will sometimes seem to seize the part with great avidity, and in a few seconds let go their hold; but when you are convinced the leech has good hold, you may then let go, and leave it to the employment it enjoys.

I here find it necessary to remark, that the small end of the leech is the head, whereas, I have repeatedly observed, that the greater part of the people, from the tail of the leech being much broader than the head, mistake the one for the other, and thereby occasion themselves a great deal of fruitless labour. When the animal has fastened himself he generally expands the tail, and sometimes attaches it very firmly to another part of the skin, but without the least pain to the part; this hold, I have observed, the leech does not quit till it is charged with blood, and then drops off all at once.

I would here observe, that the qua

tity of blood the leech imbibes, is in general insufficient to answer the purpose: therefore, when the leech comes off it is necessary to have a basin of warm water, and a sponge or rag, to keep bathing the orifice, in order to encourage the bleeding for an hour or two; if the orifice seems disposed to bleed any longer than wished for, apply a piece of lint, three or four times double, and bandage it up.

The medicinal leech may be applied with great safety and advantage, especially for obstinate head-achs arising from fulness of blood, as well as in many cases of external inflammation, with a view to extract the thick and superfluous humour with which the vessels are overcharged. If the leech will not readily fix itself, a few drops of milk may be rubbed on the spot where it is to perform the operation; or a little blood may be drawn, by making a slight puncture, after which it will immediately settle. When employed for relieving the piles, or to extract blood from the gums, it is requisite to secure the insect with a piece of rush, to prevent it either from creeping into the anus or gullet, in which cases it would occasion great distress, in the stomach or intestines. To induce the leech to quit its hold when it adheres longer than required, common salt, strewed on its head, will answer the purpose. The discharge occasioned by the puncture of a leech, is easily stopped with brandy, vinegar, &c. or may be kept open by applying warm fomentations.

As the geometrical leech often occasions great damage among trout and other fish, it has been recommended to throw a little salt water into the pond; but we doubt whether this expedient, by remedying one evil, would not be productive of still greater injury, by destroying the fish.

[Leeches are bred by Mr. KUNITZ in Eighth street, Philadelphia, who has now (1819) about four thousand American, English, and Portugese.—T. C.]

LEEK, or *Allium porrum*, L. a well-known vegetable, the native place of which is at present unknown, though it has long been cultivated in Britain.

The leaves of this plant possess a flavour similar to that of onions; affording a constant dish at the tables of the Egyptians, who chop them small, and eat them with their meat. They are also in great esteem among the Welch; and their general utility as a wholesome pot-herb, renders them a valuable culinary spice. For the proper method of cultivating the leek, see ONION.

LEG, the lower extremity of animals, which serves both for their support and motion; it is generally divided into three parts; 1. the *thigh*; 2 the *leg*, properly so called; and 3 the *foot*.

The human legs are subject to few complaints, except the common ulcers, the proper treatment of which we propose to state under that article. They are likewise apt to be sprained, fractured, or broken; in which cases great caution is requisite; but as those accidents are briefly discussed in their alphabetical series, the reader will consult the articles FRACTURES and SPRAINS. See also BANDY-LEGS.

LEGUMINOUS VEGETABLES See PULSE.

LEMON TREE, or *Citrus Lima*, L. an elegant evergreen, indigenous in Persia, rising from 5 to 10 feet in height, producing beautiful large leaves, with a profusion of sweet flowers in the spring and early summer; which are generally succeeded by an abundance of fruit, that sometimes arrives at tolerable perfection even in this country.

The culture of this plant is, in all respects, similar to that of the CITRON; for an account of which we refer to the first volume.

Lemon-juice is one of the most cooling and antiseptic vegetable productions: it improves the taste, and corrects the putrid tendency of animal food in the summer Hence lemonade affords a grateful and cooling beverage for febrile patients; [but it should be used moderately, for all acids have a tendency to produce stone, gravel, and gout, when taken too freely —T. C.]

In England the "*Essential Salt of Lemons*" is sold to make punch, and to take out ink-spots and iron-moulds. This essential salt is usually the acid of sorrel.

Boil thirty-two ounces of white tartar, (or cream of tartar) in ten pints of water in a pewter vessel. Then add about nine or ten ounces of pounded chalk or whiting, till the effervescence ceases; the calcareous earth combines with the acid of tartar, and sets free the alkali which remains in the solution. Wash this precipitate well. Then add eight ounces of strong oil of vitriol, diluted with about one gallon of water. This should be done in a glazed earthen vessel. The vitriolic acid, being placed in a warm place for twenty-four hours, decomposes the tartarous selenite, and forms *gypsum* with the chalk, and the *liquor* contains disengaged acid of tartar: evaporate, and you obtain the acid in crystals. A little lemon-peel squeezed on it, makes it pass for salt of lemons: this rubbed on ink-spots acts like other acids, and takes them out.

LENITIVE Electuary, a preparation kept in the apothecaries' shops, and consisting generally of two parts of pulverised senna; one part of coriander seeds in powder, incorporated with four parts of the pulp of tamarinds; a similar portion of prunes; and a sufficient quantity of simple syrup, so as to reduce the whole into an electuary.

It is chiefly employed as a gentle aperient in doses of one tea-spoonful, taken frequently in the course of the day; but as it is apt to become mouldy, and to lose its efficacy, if kept too long, it ought to be newly prepared, and may be more advantageously employed as a vehicle for administering the more active medicines. Nor should this compound be indiscriminately swallowed by the lower classes of people, who thus cloy their stomachs on every occasion, without knowing whether it be a proper medicine for their complaint.

LENS, in dioptrics, properly signifies a small roundish glass, of the figure of a lentil, but is extended to any optic glass, not very thick, which either collects the rays of light into a point, in their passage through it, or disperses them further apart according to the laws of refraction.

LENTIL, or *Ervum Lens*, L. an useful exotic vegetable of the pulse kind, that has long been cultivated in Britain.

It is propagated from seeds, which are either sown in the proportion of from one bushel and a half to two bushels broad-cast, or are drilled in rows one foot and a half apart, in order that the intermediate soil may be properly cleaned with the Dutch hoe. Sometimes, however, this vegetable is put in the ground together with oats or barley, at the rate of one bushel of the latter to two bushels of the former.

The lentil is an annual plant, growing to the height of about 18 inches, and producing pale purple flowers, which are succeeded by small flat pods, containing two or three round seeds. These are frequently used in soups, the flavour of which is thus much improved: the plant itself affords an excellent fodder for cattle. When, however, lentils grow among oats or barley, they should be cut while in full sap; for, if well dried and preserved, they afford an inviting food, though of a heating and flatulent nature. Nor is the fruit itself more wholesome to mankind; and Bechstein observes, that it is hurtful, and sometimes fatal to horses.

There is another kind of lentil cultivated in England, under the name of *French Lentil*, or *Tills*. It is in every respect a plant twice as large as the preceding, and is supposed to be a distinct species. It is raised from seeds, which are sown in March, in a soil that bore corn in the preceding year, and has been once ploughed. Manure is not absolutely necessary, though it will greatly increase the crop; which is said to be very copious, and may be mown several times in one season.

LEOPARD'S-BANE, or *Doronicum*, L. a genus of plants comprising seven species; the principal of which is the only indigenous one, termed *Pardalianches*, Great Leopard's-Bane, or Wolf's-bane, growing on the banks of rivers, and in the Lowlands of Scotland; it produces yellow flowers in the months of May and June.

Leopard's bane, the *German*, or *Arnica montana*, L. an exotic plant growing wild on the Alps, and on the high mountains of Germany.

This vegetable delights in a moist, shady situation; it may be propagated in autumn, when the stalks begin to decay, either by parting the roots, or by sowing the seeds, soon after they become ripe. It is a very hardy plant, and requires no other care than to be kept clear from weeds.

The German Leopard's-bane possesses an acrid, bitter taste: and, on bruising it, emits a pungent odour, which excites sneezing. Hence the country people, in some parts of Germany, employ it in snuff, and smoke it as a substitute for tobacco.

Various medicinal properties are attributed to this vegetable; but, as the alleged virtues of the German Leopard's-bane, have not hitherto been confirmed by the experience of practitioners, the real efficacy of this active plant remains to be ascertained by future observations.

LEPIDOPTERA, or scaly-winged, the third order of insects, according to the Linnæan system. The general character of this order is four wings, covered with fine imbricate scales; tongue involute, spiral; body hairy. It consists of the insects commonly termed butterflies and moths. The powder on the wings of these insects has been generally described by microscopical writers, as consisting of small feathers; but they are more in the form of minute scales, of various shapes and sizes on the different species, and even on the different parts of the same animal. Their usual appearance is more or less fan-shaped, and they are disposed in the manner of tiles on a roof, lapping over each other.

LEPROSY, or *Lepra*, a cutaneous disorder, in which the skin is rough, with white eschars resembling bran, though they are sometimes moist beneath the surface, and accompanied with an intense itching.

This loathsome distemper is at present very rare. Many cases of this disease are said to have been cured in New Jersey, by bathing the parts affected with the following application, twice every twenty-four hours, for two months: Bruise the leaves and berries of night-shade, and let the juice stand twenty-four hours in the sun, then mix gunpowder with it very thick, and reduce it to a thin consistence with sweet oil.

The leprosy is not peculiar to man, but frequently appears among quadrupeds, especially hogs; when it is generally called the Murrain; under which article we shall point out a few of its appropriate remedies.

LETHARGY, or *Lethargus*, a species of apoplexy, which is manifested by an invincible drowsiness, or inclination to sleep, from which the patient is with difficulty awakened; and, if roused, he remains destitute both of sense and memory; so that he soon relapses into his former sleep. It is attended with an increased degree of heat; slow fever; full pulse; paleness; swelling of the eyes; and a coldness of the extremities.

Various circumstances concur to produce this affection; [the most frequent cause is full living and idleness: the cure, abstinence, exercise, bleeding and purging.—T. C.]

LETTER, a character used to expres a modulation of the voice. Grammarians distinguish letters into vowels, consonants, mutes, liquids, dipthongs, and characteristics. They are divided into labial, dental, guttural, and palatal, and into capital and small letters. They are also denominated from the shape and turn of the letters; and in writing are distinguished into different hands, as round text, German-text, round-hand, Italian, &c. and in printing into Roman, *Italic*, and Black letter. The term letter, or type, among printers, not only includes the CAPITALS, SMALL CAPITALS, and small letters, but all the points, figures, and other marks, cast and used in printing: and also the large ornamental letters, cut in wood or metal, which took place of the illumined letters used in manuscripts. The letters used in printing are cast at the ends of small pieces of metal, about three quarters of an inch in length; and the letter being not indented, but raised, easily gives the impression, when, after being blacked with a glutinous ink, paper is closely pressed upon it.

Letter-foundry. See Foundry.

Letter, *Sunday*. See Dominical.

Letter *of attorney*, in law, is a letter by which one person authorises another to do some lawful act in his stead, as to give seisin of lands, to receive debts, or to sue a third person. The nature of this instrument is, to transfer to the person to whom it is given, the whole power of the maker, to enable him to accomplish the act intended to be performed. It is either general, or special; and sometimes made revocable, which is, when a bare authority is only given; and sometimes it is irrevocable, as where debts, &c. are assigned from one person to another. It is generally held, that the power granted to the attorney must be strictly pursued; and that where it is made to three persons, two cannot execute it. In most cases, the power given by a letter of attorney determines, or ceases, upon the death of the person who gave it. No letter of attorney made by any seaman, or other person, in any ship of war, or vessel, having letters of marque, or by his executors, &c. in order to impower any person to receive any shares of prizes, or bounty-money, is valid, unless the same be made revocable, and for the use of such seamen, and be signed and executed before, and attested by, the captain and one other of the signing officers of the ship, or the mayor or chief magistrate of some corporation.

Letters-clause, or *close-letters*, are opposed to letters-patent, because they are commonly sealed with the king's signet, or privy seal, while letters-patent are left open.

Letters *of credit*, among merchants, is a letter written by a merchant or banker, to his correspondent abroad, requesting him to credit the bearer as far as a certain sum.

Letter *of license*, an instrument or writing granted by a person's creditors, allowing him a certain time for the payment of his debts; by which means he is enabled to prosecute his business, without fearing an arrest

Letter *of mart*, or *marque*, a letter granted to one of the king's subjects, under the privy seal, impowering him to make reprisals for what was formerly taken from him by the subjects of another state, contrary to the law of mart.

Letters-*patent*, or *overt*, are writings sealed with the great seal; so called, because they are open with the seal affixed to them. These are granted to authorise a man to do, or enjoy, what of himself he could not do or enjoy.

To preserve Letters from being opened. Various ways have been contrived to open letters, sealed with wafers only, but the following composition is perfectly secure. Take fine flour; add thereto white of egg well whisked to a fine liquid: make a paste from this mixture, of which put a little under the sealing place; then close the two papers, and hold the part close to the steam arising from the spout of a tea-kettle or tea pot of boiling water, which will harden the cement, so that it cannot be opened without tearing.

LETTUCE, or *Lactuca*, L. a genus of plants comprising 15 species, two of which are natives of Britain: the principal of these is the *virosa*, Wild or strong-scented Lettuce, that abounds on chalky soils, and dry banks of ditches; flowers in the months of August and September. It has a strong odour, not unlike that of opium, and is possessed of similar narcotic properties, that reside in its milky juice; small doses of which, newly expressed from the plant, are recommended in the dropsy. It is said to agree with the stomach, to allay thirst, and to be mildly laxative.

Several other species and varieties of the Lettuce have, at different times, been introduced into Britain, and are now cultivated for culinary purposes. The principal of these are: 1. the Common or Garden Lettuce, which is propagated from seeds that are generally sown early in the spring, that the plant may be cut and mixed with other salads. In its more cultivated state, this kind is known by the name of Cabbage Lettuce. 2. The Silesian. 3. The Imperial. 4. The Royal Black; and 5. The Upright White Cos-Lettuces, which are the most valuable plants of this nature now reared in our gardens. They are likewise raised from seed, which should be sown towards the end of February, or in the beginning of March, on a warm light soil, and in an open situation. As soon as the plants shoot forth, it will be necessary to *thin* them, so that they may be 15 inches apart in every direction, after which they will only require to be carefully weeded; and, as the Black Cos-Lettuce grows large, it will be necessary to tie its leaves together, in order to whiten the inner part.

There are two other sorts, known under the name of *Dutch brown* and *Green Capuchin* Lettuce, which may be sown late, under walls; being very hardy, they withstand the severity of the winter, and will be valuable when no other green salad can be procured.—**Bechstein** states a curious fact, which deserves to be recorded, namely, if the two varieties last mentioned be planted together, and suffered to bear seeds, in a rich, warm, but moist soil, the future produce of such seed will be a new and very excellent kind of this plant, forming extraordinary large heads, the leaves of which are sprinkled with deep red spots, and uncommonly tender.

Properties.—The various kinds of garden-lettuce are emollient, cooling, and wholesome salad-herbs; they are easy of digestion, somewhat aperient, and supposed to possess a soporific quality: there is no doubt, that by abating heat, and relaxing the fibres, they in many instances contribute to procure rest. But, *for this purpose*, lettuces should be eaten alone.

Lettuce, the *Hair*. See Common Sow-Thistle.

LEVEL, an instrument, by means of which a line may be drawn parallel to the horizon, in order to determine the height of one place with respect to another; for laying grounds even, conducting water, regulating descents, draining fens, &c.

There are various kinds of levels, adapted to different purposes, of which we shall notice only such as are of a simple construction, and in general use.

1. The *Carpenters'* and *Paviors' Level* consists of a long ruler, in the centre of which is fixed, at right angles, another somewhat larger, and at the top of which is fastened a line, that shews the base to be horizontal.

2. The *Masons' Level* is composed of three rules, so joined as to form a rectangle, somewhat similar to the letter A: from the top of which a plummet is suspended, by means of a thread that passes over a perpendicular line marked in the middle of the base, if the ob-

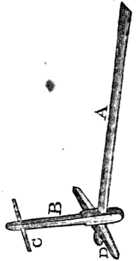
ject to which the level is applied be horizontal; but which deviates from such mark, in case one side be lower than the other.

3. The *Water Level*, which shews the horizontal line by means of water or any other fluid, is founded on the principle that water is always level. The most simple instruments of this kind are made of a long wooden trough or canal, the sides of which are parallel to the base; so that, when it is equally filled with water, its surface points out the actual degree of declivity. Or, it may be made with two cups fitted to each end of a pipe, three or four feet long, and about one inch in diameter, so that the water may communicate from one cup to the other: and, as this pipe is moveable on its stand, by means of a ball or socket, when the two cups become equally filled with water, their surfaces shew the line of level. Instead of cups, however, two short glass cylinders, three or four inches in length, may be fixed to both extremes of the pipe, with wax or mastic. Some water, either plain or coloured, is now poured into the pipe, when the liquor appears through the cylinders, and thus the horizontal line is determined. This contrivance is very simple, and of great service for taking the level of small distances.

There are various other kinds of water levels, which have been designed with a view to ascertain declivities, for the purpose of irrigating land: as these, however, are either too complicated, or otherwise defective, we refer the reader to the article IRRIGATION, where he will find an account of a more simple contrivance, illustrated with a cut, and which is calculated to remove these difficulties. Lastly, though we have several other instruments for taking levels in particular situations, yet, as their application requires a previous knowledge of mathematics, and is not strictly connected with domestic economy, our limits do not admit of farther descriptions.

LEVER, a bar made of iron or wood, one part of which is supported by a fulcrum or prop, so that all the others turn upon it as their common centre of motion.

Levers are of various kinds, according to the purposes for which they are designed; and, being eminently serviceable for the lifting of weights, we have subjoined the following representation of a *Cross-bar lever*, which is particularly calculated for raising earth that abounds with great quantities of stones; though this machine is likewise applicable to other objects. It was intended by Mrs. WYNDHAM, of Petworth, in Sussex, England, on whom the *Society for the Encouragement of Arts*, &c. in 1796, conferred their silver medal.



A, is the lever.

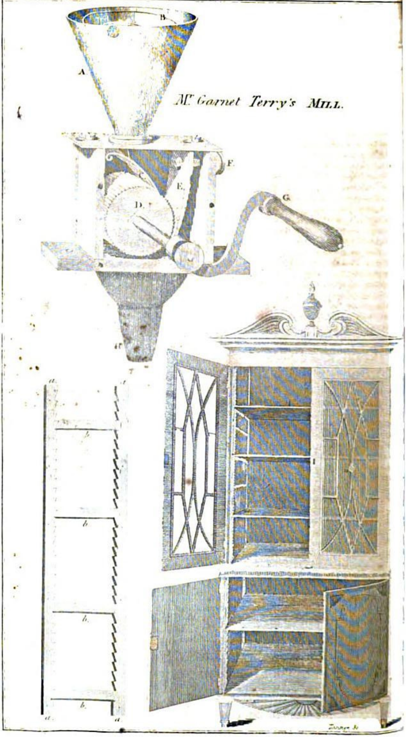
B, an upright piece of wood, to be affixed to the lever; care being taken to place the side marked with this letter opposite to that marked A on the lever; by which means it inclines backwards, and thus increases the power.

C, is a cross-bar, being the hand by which the workmen exert their strength.

D, is another cross-bar, to be placed at the bottom, behind the upright piece of wood, on which the labourers are to stand, and through which the end of the lever passes. These additions are so constructed, that they may be occasionally fixed and removed; because they are to be employed only, when the strength of the rock, or earth, requires an increase of power.

Should the rock be elevated so considerably above the ground, as to endanger the men by its fall, when the separation takes place, the lever may be reversed; so that the labourers will stand upon the bar intended for the application of their hands, in common cases; and thus all danger will be effectually prevented.

Various other levers have been contrived; but, as they relate to particular



M^r. *Garnet Terry's* **Mill.**

branches of mechanics, we shall only take notice of Mr. SMART's *sliding lever*; which he quaintly calls an *alexippos*; and which was also laid before the patriotic Society above mentioned. As various accidents happen to horses that frequently fall, while they are in the shafts; and the present construction of carts, as well as other two-wheeled carriages, is especially unfavourable to the animal in such a situation, by preventing him from being speedily raised, Mr. SMART has contrived a lever for the express purpose of relieving the unfortunate quadruped. He farther states, that it may occasionally be of service in loading carts, where the common length of those vehicles is not in proportion to the articles to be carried.

The contrivance is ingenious, and, notwithstanding its pedantic name, deserves to be more generally known: but, as we are not disposed to enter into particulars, the inquisitive reader will resort to the 18th volume of the *Transactions of the Society for the Encouragement of Arts*, &c. where this invention is fully described, and illustrated with an engraving.

LIBELULA, or *dragon-fly*, a genus of insects of the order neuroptera, of which there are sixty species. The whole tribe of the libellula are remarkable for being very ravenous: they are usually found hovering over stagnant waters, and may in the middle of the day be observed flying with great rapidity in pursuit of the smaller insects. These brilliant and beautiful creatures were once, and for a considerable time, inhabitants of the water: in that state, as larvæ, they are six-footed and very active. The Libellula varia, or great variegated libellula, which makes its appearance towards the decline of summer, is an animal of singular beauty. The female drops her eggs in the water, which on account of their specific gravity fall to the bottom; after a certain period they are hatched into larvæ. In the larva and pupa state they remain full two years, and when they have attained their size they prepare for their ultimate change, and creeping up the stem of some water plant, they make a sudden effort, by which the skin of the back and head is forced open, and the enclosed libellula emerges. This process is always performed in a morning and during a bright sunshine. In this and the other species of the libellula tribe, the structure of the eye is deserving of notice. According to LEWENHOEK there are more than 12,000 lenses in each eye of this animal.

LIBRARY. In vol. I. p. 265, (article BOOK,) mention was made of an excellent mode of constructing Book-cases, so as to admit the ready removal of the shelves. We deem it necessary to give here an engraving of it; referring, as above, for a more particular description.

a a, the upright pieces of wood in which the teeth are cut.

b b b b, cross-bars for the shelves to rest on.

LIENTERY, or *Lienteria*, is a species of diarrhœa, in which the food passes through the intestines, almost without having undergone any change: it is not attended with pain, but the patient is frequently affected with an intolerable hunger.

This disorder is occasioned by the relaxed state of the stomach, and is sometimes the consequence of dysentery, though it generally occurs during the earlier periods of life.

Considerable benefit may be derived by administering rhubarb, combined with magnesia; but, if the patient be an adult, it will be necessary to resort to stomachics and tonics, especially the Peruvian bark.

The lientery is seldom a very dangerous disease, unless the patient be of an advanced age; or the constitution be broken by excess, or acute diseases: in either cases, the diet and treatment must be the same as in the DYSENTERY, to which we refer.

LIFE, in a peculiar sense, denotes the animated state of living creatures, or that space of time during which the soul is united to the body.

Longevity has always been highly estimated by man; hence the art of preserving life has become an important study, and ought to form part of the education of every individual.—There is, however, a period at which mankind cease to grow; and beyond which our existence continues for a limited time. Thus, if a person attain his full growth at the age of fifteen, he generally dies at that of sixty; provided that no accidents intervene, by which the vital principle be affected, and prematurely extinguished. According to the calculations of others, every animal body is by Nature destined to live *eight* times the length of its growth.

From the most accurate political accounts, made by comparing the bills of mortality published in different countries and climates, we shall insert the following result:—Of one thousand persons living in large cities, no less than thirty five or thirty-six die annually; while, in country places, or small towns, only from twenty-eight to thirty deaths happen in a similar period. Among 1000 children, five die during parturition; and scarcely half that number in child-bed; but about 300 are computed to fall victims to a perverse mode of education, though suckled by their mothers; and not less than 500, or one half of all that are born, if reared by wet-nurses. The mortality of infants, indeed, has increased to a most alarming degree in this luxurious age; as the plurality of them is carried off by convulsions, and difficult teething. Among 115 dead persons, there is only one woman deceased in child-bed; and, of 400 mothers, only one by previous pains.—A greater proportion of boys than of girls die of the natural small pox. There are always to be found more aged persons in hilly or mountainous countries, than in low situations; and it is proved by the most authentic computation, that of 3,125, only one individual survives the hundredth year. From the same source, the following is the most probable chance which persons may have for the duration of their lives, after a certain fixed period; namely:

		Years.	Months.
A new-born infant will probably live		34	6
A person of one year old		41	9
of 3	-	45	7
5	-	46	4
10	-	44	9
15	-	41	6
20	-	38	3
25	-	35	3
30	-	32	3
35	-	29	8
40	-	26	6
45	-	23	0
50	-	20	11
55	-	17	0
60	-	14	2
65	-	11	5
70	-	8	11
75	-	6	8
80	-	4	10
85	-	3	3
90	-	2	0

The proportion of the female sex to that of males, with respect to the number of deceased, is as 100 to 108. Previously to the 60th year, the chance of survivorship is in favour of women; but, after that age, men generally survive them. Married women, on the whole, live longer than those in a state of celibacy. From observations made for the space of fifty years, it is evident that most persons die in the months of March, August, and September; but the fewest in November, December, and February. In populous cities, however, such as London and Paris, death makes the greatest havock during the *winter*.

One half of the human race is doomed to dissolution, before they have completed the 17th year of their age; but, after this critical period, the *survivors'* chance of life becomes more *valuable* with every year: hence, for instance, a person thirty years old, according to the preceding calculation, will probably live thirty-two years longer; so that he may attain the age of sixty-two; whereas a youth of fifteen, though he *have* a chance of living forty-one and a half years longer, will nevertheless arrive only at the 56th or 57th year of his age.

According to **Boerhaave**, the most healthy children are born in the months of January, February, and March: indeed, the greatest number of births takes place during the two months last mentioned. The proportion of boys, annually born, is to that of girls, as 104 to 100; but, on the other hand, a greater number of the former die during infancy than of the latter; so that, about the age of puberty, both sexes are nearly equal. Among 65 or 70 infants, there is generally but one instance of *twins*. The number of marriages, compared to that of the whole population of a country, is as 175 to 1000. Four children are generally computed to arise from each married couple; but, in towns, only thirty-five children from ten families. Lastly, it is proved from the records of the most experienced physicians, that, among 100 persons living in cities, throughout the year, only twenty are indisposed, or confined to their beds for one month; or twenty-four for the space of a fortnight.

We have already pointed out the most proper treatment of persons in a feeble state, under the article **Debility**; and, at the same time, stated the necessary rules and directions for the preservation of health, and consequently the prolongation of life. There is, however, so much justice in the observations of the late illustrious **Haller**, on this subject, that we are induced to insert the following brief statement. He remarks, that some of the causes which contribute to protract life, beyond its usual period, are *external*.

Such, for instance, is climate: hence, the more northern latitudes, or about 50 degrees, are the most proper for youth; because, in such a region, the circulation is less rapid, and acute diseases seldom occur. But in a more advanced age, when the pulsations of the heart are faint or slow, and its irritability is diminished, a warmer region is more salutary; and he recommends aged persons to migrate 30 or 40 degrees, or even nearer to the equator, where they may enjoy, at pleasure, the genial warmth of the sun, or the cooling shade.

Among the *internal* causes of longevity, the rudiments of a sound body, descended from parents uncontaminated by hereditary disease, are to be considered as the principal: thus dropsy, gout, apoplexy, consumption, and the long train of disorders that are too frequently transmitted from one generation to another, will in a great measure be prevented. With respect to the mode of living, **Haller** recommends abstemiousness during youth; the drink should be water, which Nature has provided for our common use; and he justly considers wine as a species of medicine. Animal food should be sparingly eaten, together with a large proportion of vegetables, and but a small addition of saline or aromatic substances. Temperance is, in every respect, an essential point; so that the quantity eaten may be well digested, and perfectly assimilated; that the blood may circulate regularly, and free from all corruption or infection, similar to that of an infant. Aged persons, however, may somewhat more freely indulge in the use of animal food: on the other hand, tranquillity, both of body and mind, is of the greatest consequence; as nothing is more detrimental, than an irritable or irascible disposition. Hence, a due mixture of a lively and placid temperament, is a very desirable condition, so as to be neither insensible of pleasure, nor too much addicted to the gratification of sensual desires. Moderation is, therefore, here likewise a beneficial attribute; but, with regard to sleep, old and decrepid people may be more indulgent. Those readers, who are anxious to become acquainted with more minute rules and directions for prolonging human life, both in a state of health and disease, will derive considerable information from Professor **Hufeland**'s "*Art of prolonging Life*," and from Dr. **Struve**'s *Asthenology; or, The Art of preserving feeble Life*," in which the subject is amply and philosophically discussed.

LIGHT, in physics, that substance, of the presence of which we are informed by the sensibility of the visual organs; from which bodies receive their colours; and which is, in some way, connected with heat.

Light is an object of research, both in optics, and chemistry; the first, inquiries into its form and laws; the second, its essence.

I. "Of light, in optics." Light, according to the Newtonian doctrine, which no subsequent discovery or theory seems to have discredited, is composed of inconceivably small particles of matter, of different magnitudes; which are emitted or reflected from every point in the surface of a luminous body, in right lines, and in all directions, with an unparalleled velocity; and whose power or intensity decreases as the squares of the distance increase.

That light is a material substance, appears from its being propagated in time, and from its acting upon and producing great alterations in other bodies; but that its particles are inconceivably small appears from this, that the greatest quantity of flame is found to have scarce any sensible gravity or weight: also because these particles pervade the pores of all transparent bodies, however hard or heavy: yet, small as they are, the rays of light consist of different sorts of these particles; and that this difference arises from their different magnitudes, seems evident from the different directions in which the several sorts of rays move, after they have passed through a body of glass, water, &c. of some special figure, especially that of a prism.

Since the weight of bodies is proportional to the quantity of matter, it follows, that, where the latter is diminished indefinitely, the former will be so too; therefore the weight of light must be imperceptible. **Boerhaave** caused a globe of iron, twelve inches in diameter, to be heated red hot, and suspended at the end of a very exact balance, and nicely counterpoised by weights at the other end, and thus let it hang till all the particles of heat or light were escaped, when he found the equilibre of the balance in no wise altered.

That the particles of light have not only magnitude, but, also, in different degrees, is another, and perhaps the most subtile discovery of the Newtonian philosophy. This is absolutely proved by the different refrangibility they are found to display in passing through a prismatic figure of glass or water; for the power of the prism detains the issuing particle, and draws it a little towards the surface; and, since this power is the same, it would have the same effect on all the particles of light, if they were all of an equal magnitude, because they have all an equal velocity. But since this effect is different among the particles, some being detained and drawn aside to a greater distance than others, it follows, they must be less in magnitude, to become more subject to the influence of the attracting surface; in like manner as the electric effluvia will act upon and agitate very small and light bodies much sooner, and more easily, than they can move those which are larger.

According to some very elaborate experiments of Dr. BRADLEY, light moves at the rate of one hundred and ninety-five thousand two hundred and eighteen miles in a second. Another account states the number of miles at one hundred and seventy thousand. The velocity of light exceeds that of a cannon-ball by one million five hundred and fifty thousand times. It is calculated to travel from the sun to the earth in eight minutes and thirteen seconds.

II. "Of light, in chemistry." Light is considered, by modern chemists, and apparently with reason, as a simple elementary body; but they have not yet been able to form a theory on this subject, in which considerable difficulties are not involved.

Light manifests itself to the mind through the mediums of two senses. To the organs of vision it presents forms and colours; and to those of touch the phenomenon of heat. It is observable, that experience so uniformly teaches us to unite the ideas of light and heat, that none but the philosopher, and he scarcely with intelligibility, would talk of *fire* that is not *luminous*, or *light* that is not *warm*: the first step, therefore, toward an analytical examination of this matter, is to separate in our minds, the *warmth* and the *light* of our hearths. To assist this attempt, we must remember that fire certainly can exist, without the company of light, since both coals and iron may frequently be met with in a state of perfect blackness, combined with violent heat.

To instance the existence of light without warmth, as in the temperature and brightness of a frosty day, is equally easy; yet, after all, light and heat still recur to the mind as inseparable things, and even of those habituated to abstract considerations, numbers are disposed to affirm that they are one and the same.

That they are not one and the same, has certainly never been proved; but this, of the two, appears the more probable conclusion. *Heat*, as is shown in the article *Fire*, is one of attributes of *caloric*; but caloric is not conceived to possess the attribute of *light*, also; and though heat and light are usually found together, this connexion has been attributed rather to mutual antipathy than to homogenuousness.

The question is, Why do combustible bodies, in the act of consuming, give out light? It is answered, Because there is a repulsion between light and caloric.

Taking for granted the previous proposition, that all combustible bodies, in greater and less degrees, contain both caloric and light, it is agreed that, supposing the reality of the repulsion, these two substances cannot be accumulated in the same body beyond a certain degree. Arrived at that, if the caloric predominate, it will tend to drive off the light; if the light, on the contrary, happen to prevail, it will displace the caloric. It is on this principle that the light flies off, in the form of flame, during combustion.

The present state of this inquiry will not allow another conclusion than an abrupt one, to this article. The properties of light, and the extent of the subject, have been indicated; but to fix the ideas of the reader, with respect to the explanation, would, probably, be only to fix them in error.

Light is essentially necessary to vegetation: in our climate, it is seldom productive of injury by its excess, though the want of it is often pernicious. This fluid acts as a kind of stimulus on the more irritable parts of plants; as appears from the sun-flower and others, that expand or bow when exposed to the rays of the sun; hence Dr. DARWIN supposes there may be diseases in plants, arising from the excess of this stimulus, but which, he thinks, have hitherto been disregarded. To corroborate this conjecture, he specifies the Goat's-beard, or Salsafie (*tragopogon*, L.) and some other vegetable productions, which close their flowers about noon, in order to prevent the influence of such stimulus.

On the contrary, the absence or defect of light produces a disease called *etiolation*, or *blanching*, because vegetables deprived of that fluid become white. It has a similar effect on animal bodies; which, as Dr. DARWIN has pointedly remarked, are in consequence rendered pale and inert: this is confirmed by the languid and *etiolated* countenances of the young ladies in some boarding-schools, where, from false motives of delicacy, they are secluded both from the light of the sun, and the invigorating influence of the air: it is still farther evinced in those studious persons, who pass their waking hours in unventilated apartments, especially during a considerable part of the night.

But, though such *etiolation* be naturally injurious to vegetation, it has been artificially employed with success, in rendering certain plants esculent, by depriving them of their acrimony, cohesion, and colour. This method is chiefly practised on celery, by earthing up that plant nearly to the top; on seakale, by covering it entirely with horse-litter or straw; and, lastly, on lettuces and endive, by tying the root-leaves together with a bandage. Opinions respecting the chemical effects of light are not less unsettled than those concerning its nature. The inquisitive reader will find ample information on this subject, in the writings of Dr. PRIESTLEY, and also in the different volumes of the *Transactions of the Royal Society*.

LIGHTS, *Northern*. See AURORA.

Bengal Lights.—These curious lights, which are much used in the East Indies, make the night like day, and are seen at an immense distance. They are of great service in fortifications, for ships, and even for private dwellings, to discover an enemy or thieves; for which purpose they are placed on any eminence, as the top of a castle, a steeple, a mast-head, or a county-house. The ingredients for making them are as follow: Saltpetre pulverised, 2¼ lbs.; flour of brimstone, ½ lb.; red orpiment, 2 oz.; and zinc ½ lb.; pounded in a mortar. Half the quantity of antimony is frequently used instead of the ½ lb. of zinc, but the zinc is greatly preferable. Ram the whole, well mixed, hard into an iron pan or large iron ladle; and, if intended to burn slowly, wet it with a little water, first making trial with a small quantity. Strew over it some gunpowder for the purpose of setting it on fire when requisite. An inferior sort may be made with only 2 lbs. of saltpetre, ½ lb of flour of brimstone, and three ounces of argol.

India Blue Lights.—Take nitre, in fine powder, 28 lbs.; flour of brimstone, 9 lbs.; orpiment, 2 lbs.; and wheat, or barley meal, ½ lb. Mix ½ a lb. or more, in a flat earthen pan, which is sufficient for a signal; and squeezing it to a paste, place a piece of cartouch paper on it, so as completely to cover the edge of the pan. A piece of port-fire metal is to be placed in the centre; which light, having made a hole for that purpose.

LIGHTNING, in meteorology, a flash of light suddenly appearing in the atmosphere, and commonly disappearing in the same instant; sometimes attended with clouds and thunder, and sometimes not.

Lightning is proved, by the experiments of FRANKLIN, to be produced by the electric fluid. Thunder is the explosion of clouds charged with that fluid. Lightning is to thunder, what the *flash* is to the *report* of gunpowder.

A very remarkable property of lightning, the zig-zag kind especially, when near, is its seeming omnipresence. If, when a clap of thunder, accompanied with this species of lightning, occurs, two persons are looking different ways, both will perceive the flash; not only that indistinct illumination of the atmosphere which is occasioned by fire, of any kind, but the form of the lightning itself; and every angle it makes in its course, will be as distinctly seen by each, as if they had looked directly at the cloud whence it proceeded: and if a person were at that moment looking at a book, or any other object, that he held in his hand, he, also, would distinctly see the form of the lightning, between his eyes and the objects. This property seems peculiar to lightning.

The different forms of the flashes of lightning are all equally found in electric sparks; so that an account of the origin of this difference of form may, by analogy, be drawn. Where the quantity of electricity is small, and, consequently, incapable of striking at any considerable distance, the spark appears straight, without any curvature, or angular appearance; but where the electricity is very strong, and, of consequence, capable of striking an object at a pretty considerable distance, it assumes a crooked or zig-zag form.

In common with electricity, lightning possesses the property of burning and dissolving metals; it rends bodies, often deprives persons of sight, and sometimes extinguishes the vital principle; divests magnets of their virtues, and reverses their poles. Indeed, there is no appearance in nature, that presents a greater diversity to the contemplative mind; for each flash is widely different from another; nor are its effects alike fatal.

When the igneous meteor exhibits a deep red colour, it is seldom accompanied with dangerous consequences; but, if the flashes be bright, pale, and in a zig-zag direction, destruction generally marks their course. The most mischievous form, however, which lightning assumes, is that of fiery balls: wherever such masses descend, they burst, and occasion extensive damage.

As lightning uniformly strikes the most elevated objects, such as lofty trees, steeples, and particularly the masts of ships and chimnies of houses, various expedients have been contrived, in order to divert, or at least break its force. These efforts of human ingenuity were first published, or recommended to public notice, by Dr. **Franklin**; and, from their acknowledged utility, **Conductors** are now generally adopted. We have already pointed out the most judicious form of constructing them in our first volume.

Another method of preventing the fatal effects of lightning, consists in the artificial attraction of electrical matter from the clouds, by means of a **Kite**.

Persons struck with lightning may, in many instances, be restored by proper and timely applications. In slighter cases, where particular limbs are affected, the wounded part has been cured by washing it with a solution of sugar of lead. According to **Tode**, considerable relief has been derived from applying opium to the painful part of the breast, after being hurt with lightning; and a person, wounded by this meteor, was perfectly cured in the course of ten days, by the application of ley to the part affected, and by the internal use of carbonate of pot-ash, or fixed vegetable alkali dissolved in water. Should, however, any person be apparently killed by such an accident, he ought by no means to be neglected, or precipitately committed to the grave; for we are persuaded that many *might be* restored, if proper resuscitative means were employed.

In general, there are no external marks discoverable, when the body has been injured by a flash of lightning; though sometimes red streaks appear on different parts, especially on the chest and arms, in which the patient, after recovery, experiences a sense of burning heat. The first step should be, to remove the body from the farther influence of mephitic air of the place, where the unfortunate blow was inflicted. Clothes and bandages of every kind must be removed; the body placed in a reclining posture; and the head raised, somewhat leaning to the right side: thus the subject is to be covered with warm blankets or clothes; while both the doors and windows are opened for admitting fresh air.

Resuscitatives: Sprinkle the face with cold water; put the whole body up to the neck if convenient, in the earth-bath, where it should be kept for several hours, till certain signs of returning life appear: or expose the subject, if robust, to the influence of the shower-bath; apply cold poultices to the head; cloths dipped in vinegar to the pit of the stomach; and gentle friction, which should be resorted to, alternately, with the sprinkling of cold water, from the beginning of the process; at first with great caution, over the lower extremities, and gradually extending it upwards to the left side of the body.

In particular cases, where the means before stated prove ineffectual, it will be advisable to open a vein, or to electrify the patient, by directing the shocks through the breast, so that this fluid may pervade the heart. Meanwhile, pure air may be blown into the lungs (see article **Drowning**); and if anxiety appear to prevail, blisters should be applied to the chest.

When *signs of returning life* become evident, the mode of treatment before pointed out, must be continued for some time, though with great moderation. The cloths applied to the pit of the stomach, should now be dipped in wine, or *warm* vinegar; common poultices applied to the injured parts; and emollient clysters may be occasionally given. Lastly, when the patient is able to swallow, a mixture of wine and water, or balm-tea, may be safely administered.

Dr. **Franklin** suggests to those persons, who are unreasonably apprehensive of danger from lightning, the propriety of sitting in the middle of a room on one chair, and to lay their feet on another; provided they be not placed beneath a metal lustre suspended from the ceiling by a chain. He farther observes, that it is still safer to fold two or three mattresses or beds in the middle of an apartment, and to place the chairs upon them; for, as the former do not conduct lightning so readily as the wall, the flashes cannot penetrate their substance. But the most secure place, in his opinion, is a hammock, suspended by silken cords, in the centre of a room. The curious reader, who wishes to obtain farther information respecting electrical meteors, will be amply gratified, by perusing Dr. FRANKLIN's *Experiments and Observations on Electricity*, and Dr. PRIESTLEY's *History of Electricity*, in which this interesting subject is perspicuously treated.

To avoid the bad effects of Lightning.

1. A conductor.
2. When in a house, the middle of the room is the safest place.
3. When exposed to the storm abroad, the middle of a plain is safer, avoiding single trees, especially chesnut trees.
4. When in a wood or forest, avoid standing under, or near any very tall trees.
5. During the rising or continuance of a thunder storm, avoid touching the conductors of any building, or being very near them, especially at an open window.
6. In the country, shun all trees where scythes, and other metallic implements of husbandry are hung up.

In case of the suspension of animal motion, the remedies are the same as for drowning; except that much stronger shocks of electricity should be sent from the breast, through the back, and from one side of the breast to the other, and this should be done with as little delay as possible, in order to excite the heart and the system of blood vessels connected immediately with it, into motion.

The effects of lightning are frequently not less fatal to vegetable productions. Wheat-plants are peculiarly susceptible of this injury; and Mr. TULL is of opinion, that not only their health is thus greatly impaired, but also their immediate decay is thereby often occasioned. Such consequences, he observed, were evident from the black spots or patches in a field of corn, especially in those summers which were visited by frequent thunder storms: and he adds, that there is no remedy against this evil.

Forest-trees, in particular, experience similar blasts; and, on sawing them, numerous instances have occurred, in which they were found cracked, split, or otherwise mutilated by lightning. Dr. DARWIN conjectures that vegetables are affected by this meteor in a manner similar to that, when their succulent shoots are frozen; that is, their vessels burst, as the lightning passes through them, in consequence of its expansive power.

LIGNUM VITÆ. The lignum vitæ tree is a native of the West Indies, and the warmer parts of America: there is also a species, a native of the Cape of Good Hope. It is a large tree, rising at its full growth to the height of forty feet, and measuring from fifteen to eighteen inches in diameter; having a hard, brittle, brownish bark, not very thick. The wood is firm, solid, ponderous, very resinous, of a blackish yellow colour in the middle, and a hot aromatic taste. It is so hard as to break the tools which are employed in felling it; and is, therefore, seldom used as fire-wood, but is of great use to the sugar-planters for making wheels and cogs to the sugar-mills. It is also frequently wrought in bowls, mortars, and other utensils. It is imported into England, in large pieces of four or five hundred weight each, and from its hardness and beauty, is in great demand for various articles in the turnery ware, and for trucks of ship blocks. The wood, gum, bark, fruit, and even the flowers of this plant, have been found to possess medicinal virtues.

LILAC, or *Syringa*, L. a genus of exotic plants, natives of Persia, consisting of three species, the principal of which is the *vulgaris*, or Common Lilac. It has long been cultivated in our gardens, on account of its ornamental flowers; and, if properly managed, will grow to the height of 18 or 20 feet.

This shrub thrives on almost any soil, but it produces the most beautiful flowers on rich, light land, though it flourishes best on wet grounds. It is propagated by suckers, which should be separated from the parent plants in the month of October, and set in a nursery, in rows three feet asunder, each sucker being one foot distant from the other. In the second or third year, they may be removed to the spot where they are intended to remain. After this operation, no farther attention will be required, except digging about their roots once in the course of the year, and cutting off the suckers; which not only destroy the beauty of the plant, but likewise deprive it of its nourishment.

The leaves of the Common Lilac are frequented by the Spanish Fly: the yellowish and red streaked wood of old trees is valuable to turners and cabinet-makers; as the vessels or utensils manufactured of it, are equal to those made of olive-wood, and almost indestructible: by immersing such articles in a cold dye, consisting of aqua-fortis largely diluted with water, they acquire a fine red colour. From the flowers of this plant may be distilled an essential oil, similar to that of roses.

LILY, or *Lilium*, L. a genus of exotic plants, consisting of ten species, all of which are remarkable for the beauty of their flowers; but the two following deserve a distinguished place:

1. The *candidum*, or WHITE LILY, which produces a beautiful flower, the fragrant odour of which is so powerful as to induce fainting, if numbers of it be kept over night in a close apartment:—an essential oil may be obtained from them, in a manner similar to that described under the article JASMINE.

2. The *bulbiferum*, or FIRE LILY, which also bears fine flowers of a flaming red colour, and which, by culture, sometimes become double. The Russians and Tungusians eat the roots of this species, either roasted, or boiled in milk; and Dr. FRANKE informs us (in his *System of Medical Police*, printed a few years since, in German), that these mealy roots might, in times of scarcity, be prepared into wholesome bread. On account of their emollient, and maturating properties, they have been greatly recommended in the dropsy; but are chiefly employed in cataplasms, when boiled, and bruised into a pulp, with oil: in this manner, they are said to form an efficacious application to recent burns.

In the United States we have the following native species of lily. *L. Superbum*. This well deserves its name, as it is a truly elegant plant. The stem rises 13 feet in height, and is crowned with a pannacle of between 40 and 50 flowers of a red colour, yellow within, and spotted like a leopard's skin with dark crimson, almost black. 2. *L. Philadelphicum*. 3. *L. Canadense*, 4. *L. Carolinianum*, all elegant flowering plants. In Kamschatska, the inhabitants eat the root of the lily, boiled or roasted.

LILY-OF-THE-VALLEY, or MAY-LILY, *Convallaria Majalis*, L. an indigenous perennial plant, growing in woods, heaths, and at the foot of hills: it flourishes in the month of May.

This vegetable is eaten by sheep and goats, but refused by cows, horses, and hogs; its flowers are in a high degree fragrant; but, when dried, they acquire a narcotic scent, and, if reduced to powder, excite sneezing. Both the flowers and roots have a bitter taste; and an extract, made from either, possesses similar purgative properties with aloes; the dose being from 20 to 30 grains. A beautiful green colour may be prepared from the leaves, with the addition of lime.

LILY, the WATER, or *Nymphæa*, L. a genus of plants comprising nine species, two of which are natives of Britain, namely,

1. The *lutea*, Yellow Water-lily, or Watercan; which grows in gentle rivers, pools, and ditches; blows in the months of July and August. When the small yellow flowers begin to fade, the seed returns to the water, in which element it attains to maturity, and again germinates. This aquatic vegetable is eaten by hogs; but goats do not relish its flavour, and it is totally refused by horses, cows, and sheep. The flowers possess an odour similar to that of *brandy*; and the roots, if moistened with milk, are said by LINNEUS to destroy crickets and cockroaches.

2. The *alba*, White Water-lily, Candock, or Water-socks, which grows in ponds and slow rivers: flowers in the month of July. This species is one of the most beautiful British plants, and may be propagated by transplanting its bulbous roots in the winter. It is eaten by hogs, but disliked by goats, and totally rejected by cows and horses. The roots are employed in Ireland, and the Island of Jura, for dyeing a dark brown colour: but the Egyptians eat them boiled, and convert the seeds into bread. The Swedes also, in prevailing dearth, have used the root of this plant as a substitute for corn; though it requires to be previously divested of its bitter taste, by frequent ablutions.

According to GLEDITSCH, the roots of the white and yellow lily are equally useful in tanning and currying.

Several species of *Nymphæa*, or Water-lily, are natives of the United States; as *N. alba*, *N. lutæa*, *N. odorata*, *N. advæna*, *N. sagittifolia*, *N. reniformis*, *N. Lotus*, *N. Nelumbo*. The two last are particularly worthy of notice.

1. *N. Lotus* is also a native of Egypt; where the roots, boiled in water, have been eaten, from the earliest antiquity. It is distinguished from all the other species, by having dentated leaves.

2. *N. Nelumbo.*—This plant is known by the name of *Nelumbium Speciosum.* It abounds in Brogden's creek, between Philadelphia and Gloucester Point, and Mr. Wm. Bartram informs, that it is found in lakes, ponds, and stagnant bays of large rivers, on the Atlantic coast, from New-Jersey to East and West Florida; and Westward, as far as Lake-Erie. The leaves are orbicular and peltated, and very large, particularly those lying on the surface of the water, many of them being eighteen inches, and two feet over. The flowers appear in Pennsylvania in August, and when expanded, are 4 and 5 inches in diameter, and of a lemon-colour, and make a fine appearance. The flower is succeeded by a turbinated pericarp, containing many oval pointed seed of the size of an acorn; their points perforate the horizontal surface of the seed vessel, and when fully ripe, are black, and hard. The kernels resemble in taste, that of the chinquapin (*fagus pumila*). Sir George Staunton informs us, that in China, the roots of this plant are highly esteemed, and are sliced and served up at table with ice in summer. In winter, they are preserved in salt and vinegar. A conserve is also said to be made of the nuts when not quite ripe, and given as a restorative after sickness. This plant ought to be cultivated in every creek having a muddy bottom. The seeds must be placed in the spot they are intended to occupy, immediately on being taken from the seed vessel.

LIMAX, the *Slug*, of which there are sixteen species. The one which we shall notice is the limax agrestes; body whitish, with black feelers: five varieties, of which some have the power of secreting a large quantity of mucus from the under surface, and forming it into a thread like a spider's web; by this means it often suspends itself, and descends from the branches of trees, or any height it had crawled up to. It is found in gardens, pastures, and groves, from May till December. One of the varieties of this species is that which has been recommended to be swallowed by consumptive persons; it is half an inch long, and when touched it sticks, as if dead, to the fingers.

LIME, a white, soft, friable substance, prepared of marble, chalk, or other calcareous earth, by burning them in a kiln.

The common form in which limestone is found, is that of combination with the carbonic acid. The lime is obtained, in a caustic state, by exposure to a high degree of heat, whereby the carbonic acid is driven off in the state of gas, or air. It is then called quick-lime, and in that condition, is employed in husbandry and the arts. After having been deprived of its fixed air, the lime is constantly, though slowly, regaining it from the atmosphere, and all other bodies with which the lime comes in contact, and capable of furnishing it. According to Mr. Kirwan, 100 parts of quick-lime, absorb about 28 of water; and to regain its full proportion of air from the atmosphere, it requires a year or more, if not purposely spread out.

[A ton of lime-stone ought to be reduced in the kiln, to 1100 wt.: otherwise it is not sufficiently burnt. It will regain two-thirds of the lost weight by exposure to air for a week or ten days.—T. C.]

Pure lime-stone, says Dr. Anderson, when fully calcined and slacked, is reduced to a fine impalpable powder of a bright white, that feels soft between the fingers, without the smallest tentency to grittiness. When it has any colour, it proceeds from iron, or other foreign matters in the composition.

The chief uses of lime are,

1. As an ingredient in mortar to *cement* brick or stone buildings; for which purpose, being divested of its humidity, and its pores being at the same time opened by the action of the fire, it is so eminently calculated, that it may be easily reduced to powder, and mixed with sand or other matters. See Mortar.

2. As a *manure*, it is of the most extensive utility; we shall, therefore, concisely state the properties of the best lime-stone, as well as the proportionate quantities in which it is to be spread on lands; and at the same time point out those soils that are really ameliorated, and likewise such as receive no benefit from its application.

Formerly an opinion generally prevailed, that the most efficacious lime for manuring lands, was produced from the hardest calcareous stones, which most intimately approached the nature of marble: modern experience, however, has amply refuted this supposition. It appears, indeed, that there are two sorts; namely, *magnesian* and *calcareous* lime-stone; the latter of which is attended with the most beneficial consequences, while the former is highly injurious to *land.* This remarkable fact was first published by S. Tennant, Esq. in the "*Philosophical Transactions of the Royal Society*," for 1799; who, being informed of the opposite nature of the two species, made various experiments, in which their respective properties were clearly ascertained.

[All the lime-stone of *primitive* formation, contains magnesia: all white *marbles*, contain about 10 per cent. of magnesia. Mr. TENNANT's remark applies only to quantity: he is mistaken as to quality. You must put less of the magnesian lime on your land by about one-third, than of common lime.—T. C.]

The barren, or magnesian lime, is found in various parts of England, but especially in the county of Nottingham, where a quarry of it is worked to the extent of thirty or forty miles; also in the counties of Derby and Northumberland, in the latter of which it is known by the characteristic name of *hot*, in contradistinction to the *mild*, or calcareous lime, that abounds in all parts of Britain. We regret that we cannot enter into a detail respecting Mr. TENNANT's important discovery; the particulars of which are recorded in the volume above mentioned. The magnesian lime may be further distinguished from that made of pure calcareous stone, by its slow and difficult solution in acids.

When burnt, it is called *quick-lime*, and should be spread as speedily as possible, immediately before the plough; so that the greater part may be slacked in the soil. The proportion used, depends much on the custom of the country; but should more properly be adapted to the nature of the land. In the county of York, *thirty-six* bushels only are carted on an acre; in Wales, a quantity somewhat larger; in Ireland, from *five* to *six hundred* bushels are spread on every English statute acre; and in various parts of England, very small portions are injudiciously scattered: for it is the opinion of the most experienced agriculturists, that *three* or *four hundred* bushels at the least (if the price be not too high) should be allowed to each acre; especially when the soil has long been in an uncultivated state. One *good liming* is, in such cases, decidedly preferable to small quantities frequently repeated.

[It depends on the kind of soil: stiff clays require the greatest quantity.—T. C.]

In common situations, however, where the land does not abound in putrescible matters, and is not vitiated by acids, Mr. YOUNG is of opinion, that 160 bushels per acre, will produce a considerable effect; but, on stiff strong clays, he thinks at least double, or triple, that quantity ought to be allowed.

If lime be applied without any other manure, it is said to exhaust the most fertile particles of the soil. Some agriculturists, therefore, suggest the propriety of forming small heaps, and covering them with earth: as soon as the soil has, by its moisture, slacked the lime, the heaps are to be opened, and as much dung buried in each as the earth will cover. A more economical and judicious method, is that stated by Mr. ANDREWS, in the 4th vol of *Annals of Agriculture*. He directs about 140 loads (each containing 40 bushels), of moist dung to be heaped up in the month of December, when 200 bushels of lime are to be well incorporated. The whole is then suffered to lie for three months, after which the heap is to be well stirred: when the harvest is completed, the compost is to be spread on a pea-stubble, and ploughed in for barley; but, if the season should not favour the purpose, he directs these labours to be performed after the first frost that occurs. Mr. ANDREWS farther observes that, in consequence of such management, his barley-crops have, upon an average of twelve years, amounted annually to four quarters and six bushels per acre.

The advantages arising from this treatment, are, 1. The total destruction of the seeds of weeds, so that the land on which this mixture had been spread, was uniformly the clearest: and, 2. The increased fermentation of the dung, by which its fertilising properties are more speedily excited. Lastly, the expense of the lime was to him 10*s*. per acre; and its beneficial effects continued for four years.

The soils peculiarly susceptible of improvement, by means of lime, are:

1. Rich black or brown friable crumbling loams, which abound with vegetable matter; its general putrescency being accelerated by the lime, such land is so greatly ameliorated as to yield crops, which they could never have produced by the application of any other manure.

2. On low, rich, drained meadows, that have formerly been bogs, and the black soil of which abounds with vegetable fibres.

3. On old sheep-walks, heaths, and

commons, which have been under grass for time immemorial, and are first to be converted into arable land; but lime will not be of any advantage, after they have been cultivated for several years. And, though such manure will produce favourable effects upon old *lay* soils, abounding in vegetable particles, yet when the latter are putrified by *liming*, and exhausted by repeated *cropping*, it will be of no service.

4. On moory, boggy, mountainous land; and, according to Dr. HUNTER, on black peat-earth. In his opinion, lime prevents the spontaneous growth of heath, and produces a new family of vegetables, especially white clover. He farther remarks, that the greatest improvements ever made on moors, in any country, have probably been effected by means of lime. There prevails, however, a diversity of opinion on this subject, which we are unable to reconcile. In the 16th vol. of the *Transactions of the Society for the Encouragement of Arts*, &c. THOMAS DAVIS, Esq. (steward to the Marquis of BATH), states that though lime is the only proper manure for such soil, which is thus qualified to produce crops of corn for the first three or four years, after converting it into arable or meadow land; yet this manure loses its ameliorating properties in the course of ten years (during which time the vegetable roots, according to DUNDONALD's *Theory*, might be supposed to have been dissolved): and he never found a second liming to be productive of any beneficial effect.

5. On all other waste soils that have been over-run for ages with furze, heath, broom, fern, bushes, or wood; and which, though richly stored with vegetable food, have contracted an acidity, in consequence of their long rest, and the spontaneous growth of roots.

On the contrary, lime is of little service on poor, light, and thin soils; or such as are on a quarry of lime or other stone, especially after they have borne crops for a considerable number of years. Nor is it productive of any advantage on strong, stony land; on wet, cold loams, which have not been sufficiently drained; or similar clays that are tenacious of moisture; but Mr. ARTHUR YOUNG is of opinion, that large quantities of *well-drained* lime, laid on very stiff clay, would be attended with a favourable effect; though he candidly adds, that it never has been tried to his satisfaction.

[Oyster-shells are frequently burnt into lime, to lay upon land. They are a better manure when ground without burning, owing to the remains of animal matter in them. A good lime compost is the following: spread on any platform under cover, 6 inches of mould, then 3 inches of well burnt lime, slack it with water in which common salt is dissolved, to the amount of 1½ lbs. of salt to each bushel of lime: cover it with 6 inches more of mould. Before laying it on the land, turn and mix this compost heap, and lay three hundred bushels of it on each acre.—T. C.]

Quick-lime is also of great utility in rending rocks and stones, when mixed with gunpowder, in the proportion of one pound of the former, well dried and pulverised, to two pounds of the latter. This singular property of lime was discovered, and is related, by H. D. GRIFFITH, Esq. in the 8th vol. of the *Transactions of the Bath and West of England Society;* where he states, that the mixture above specified, caused an explosion with a force equal to *three pounds* of gunpowder: hence in those operations, one-third of the expense may be saved.

It has been said in a late French publication, that the mixture of salt with lime for white-washing, is an Egyptian practice; and that experiments were made at the *Prytaneum* in Paris, to prove the advantages derived from it. The philosophers who accompanied BONAPARTE to Egypt, were more observant than those who visited the United States during the American war; otherwise, the knowledge of the effect of mixing salt with lime-wash, in rendering walls on which it is put, smooth and glossy, which is familiar to every notable housewife in the United States, would not have been concealed, until last year, from the European world.

Lime-water was formerly and deservedly in great repute as a solvent of the stone, and a remedy in scrophulous affections; [and to the amount of a pint a day, taken at thrice, in dyspepsia.—T. C.] It has likewise been used both externally and internally for cutaneous eruptions; though we by no means approve of its indiscriminate use, which may be attended with dangerous effects. On account of its astringent properties, this preparation has also been successfully prescribed in cases of *dia-*

betes, or immoderate flow of urine; and other disorders proceeding from laxity or weakness of the solids. At present, it is chiefly used for washing foul or ill-conditioned ulcers.

The theory of the action of lime upon soils, is by no means settled; [it appears to be only a manure of stimulus, not a pabulum.—T. C.]

LIME-GRASS, or *Elymus*, L. a genus of plants comprising twelve species: the principal of these is the *arenarius*, or Upright Sea Lime-grass, which grows on the sea coast, and flowers in the months of July and August. It is eaten by cows, horses, and goats, but refused by sheep; Dr. **Withering** questions whether it may not be advantageously formed into ropes, in the same manner as the Tough Feather-grass (*Stipa tenacissima*, L.) is manufactured in Spain. This plant is of essential service on the coast, for preventing the encroachment of the sea, in which respect it saves millions of florins to the Dutch, who cultivate it with great industry. Its mealy seeds and roots have, in times of scarcity, been converted into bread; and the grass itself, while young, affords proper food for cattle. *

LIMES, the fruit of a variety of the Citron-tree (which see); growing abundantly in Jamaica, and other warm climates; it is the smallest production of the kind; has scarcely any pulp; but contains a very sour juice, of a yellow greenish colour. On account of its strong acid, it is by the West Indians generally used as an ingredient in punch, though it is frequently productive of the most alarming colics, especially the *dry belly-ach*, of the cure of which we have already treated under the article **Lead**.

The inspissated juice of limes possesses a fine flavour; but, as it is one of the most corrosive acids, which is not suffered naturally to arrive at maturity, we cannot recommend it for its salubrity. Nevertheless, the negroes in the West Indies employ this fruit with singular success for the cure of "scorbutic swellings of the legs, and stains of the skin, merely by rubbing the affected legs, knees, and hams, three or four times a day, with a fresh-cut lime." The same remedy is used in Jamaica, for mitigating those violent pains in the bones, which precede the disorder called the *yaws*.

LIME-TREE. Linden-tree, Black poplar or Belstead, or *Tilia*, L. a genus of trees consisting of seven species; the principal of which is the *Europæa*, common Lime-tree, or Linden-tree, growing in woods and hedges; flowering in the month of July. In a rich soil, it attains a prodigious size, being sometimes twenty feet in circumference, but frequently hollow: there are instances of lime-trees having survived 800 years, in different parts of Germany.

The linden-tree is erroneously supposed to be a native of Britain; for, according to Mr. **Pennant**, it was imported into England previously to the year 1652. The blossoms of this tree are of a whitish colour, possess a fragrant smell, and supply the bees with the best honey. Whether fresh or dry, they easily ferment, and **Marggraf** distilled from them a very fine flavoured brandy. The wood is soft, light, and smooth; close-grained, and not easily subject to be infested by the worm, if kept in dry places. It is used for making leather-cutters' boards, for carved work, and likewise for turnery-ware.

Excellent ropes are made of the inner bark on the Continent of Europe, and which do not soil the linen suspended on them for drying: from the same substance the Russians manufacture mats, shoes, and other rustic garments. Linden cordage is so remarkably strong and elastic, that in this respect it is superior to iron chains.

The lime-tree is remarkable for the excrescences, or *galls*, which appear on the edges of its leaves during the spring: they are of an oblong irregular shape; of a reddish colour, and occasioned by a worm that inhabits them while alive, and which was first discovered by **Reaumur**. These animo-vegetable productions being very numerous, he was of opinion that they might be advantageously employed in dyeing: and, to ascertain their properties, he made various experiments, by rubbing the galls on linen, to which they imparted a beautiful red colour that was not discharged, though it had been washed two or three times. Hence, it is highly probable that *lime-galls* may be rendered valuable in the art of dyeing; and a considerable expense, which is at present incurred by the importation of cochineal, and similar drugs, might thus be saved.

The wood of the lime-tree, though affording an indifferent fuel, may be converted into excellent charcoal for drawing, and for the manufacture of gunpowder.

LINE, for *angling*, a series of threads, or horse-hairs, twisted together, suspended on a rod, and furnished at the end with a hook for catching fish.

The best material for making lines,

is horse-hair, which should be uniformly twisted, as its strength will thus be considerably increased. Silk is also occasionally employed; but it is by no means equal to hair. The best colours for lines are, sorrel for turbid waters, and white, or grey, for clear streams. A light green tinge may be imparted to fishing-lines, by immersing the hair in a liquor prepared of alum, soot, and walnut-leaves boiled together.

LINEN, a well known kind of cloth, made chiefly of Hemp and Flax. Having already described the different processes which these substances undergo, before they are converted into cloth, we shall at present add only such facts as may tend to render our former statement more satisfactory. After the filaments have been properly dressed and combed, the flax is spun into the yarn by the hand, in the usual manner: instead, however, of moistening the threads with spittle, or common water, we would recommend the mucilage prepared from the Common Comfrey (which see) to be preferably employed. By such simple means, the saliva, so useful in the process of digestion, may not only be saved, but the yarn will be totally divested of its brittleness, and, in other respects, considerably improved. Next, the yarn is conveyed to the loom, where it is woven into cloth (a process similar to that practised with wool, and described under the article Cloth); after which it is bleached, in the manner stated under that head in our first volume.

LINIMENT, in Pharmacy, a composition, the consistence of which is of an intermediate nature, between unguents and oils: it is employed for anointing different parts of the body. The common preparations of this kind are:

1. The *simple liniment;* which consists of four parts of olive-oil, and one part of white wax: the whole is gradually incorporated, till it acquire a due consistence. It is chiefly used for softening the skin, and healing chaps; for which purpose, however, honey-water, in general is more efficacious.

2. The *liniment of ammonia;* which is prepared by simply shaking equal proportions of the water of ammonia and olive-oil in a phial, till the whole is thoroughly mixed. This compound is of great service in inflammatory quinsies; for a piece of flannel, moistened with it, and applied to the throat every third or fourth hour, frequently carries off, or at least diminishes the violence of the inflammation.

3. *Lime-water liniment;* which consists of equal parts of lime-water and linseed-oil, properly incorporated. It is very useful in scalds or burns, and if timely applied, effectually prevents the inflammation which generally takes place in such cases.

4. The *anodyne liniment* or *balsam;* is prepared by digesting one drachm of opium, and half an ounce of castile soap in four ounces of rectified spirit of wine, for the space of three days; then adding two drachms of camphor, and half a drachm of distilled oil of rosemary: the vessel should be agitated, that the various ingredients may be properly mixed. This composition is frequently employed with success, for mitigating the pains arising from sprained limbs, and similar local affections.

LINNET, or *Fringilla linota*, L. is a very elegant bird, of which there are several varieties: it is of a small size, and a greyish brown colour; the lower part of its breast is tinged with a fine blood-red spot, which disappears in the moulting season, and again becomes visible in the spring.

Linnets are deservedly esteemed for their song: the female constructs her nest in hedges and furze-bushes on heaths; deposits five whitish eggs, spotted similar to those of gold-finches; and broods three or four times in the year.

LINSEED, or Lintseed, is the fruit of the flax-plant, or *Linum*, L. from the stalks of which, linen, cambric, and other sorts of cloth are manufactured.

According to the most experienced cultivators of flax, the excellence of the seed depends upon its weight, and the brightness of its colour. But, though such marks of distinguishing old from fresh, or heavy from light linseed, may be sufficiently accurate for the purpose of expressing the oil, yet they do not afford a satisfactory criterion, in selecting the most proper seed for the culture of this valuable plant. Hence, a handful of linseed should be thrown into a glass of water; and, if the whole or greater part of the grains in a few minutes sink to the bottom, such seed will be fit for sowing: or, by putting a small quantity of them in a silver spoon, and holding it over a moderate fire, all the grains that contain the germinating principle, will speedily escape. But the most certain method of determining their vegetating property is the following: Mix three parts of earth with one part of slacked lime; scatter a certain number of grains over this compost, moisten it with a little water, and attentively observe whether, in the course of 16 or 18 hours, all the grains have commenced to germinate. As lime uncommonly promotes the process of sprouting, it may be fairly concluded, that such of the seeds as evince no disposition to swell, within the time above stated, are unfit for being committed to the ground. See farther, FLAX.

Linseed may be advantageously employed for the feeding of cattle, both when the oil is expressed, and also by boiling it into a jelly, as directed in article CATTLE.

LINT, in surgery, signifies linen scraped so as to form a soft, woolly substance, which is employed in dressing wounds. It is made into various forms, denominated according to the shape of which they consist. Thus, if it be oval, it is called a *pledget;* and, if cylindrical, it is termed a *dossil.*

The purposes to which lint is applied, are, 1. To prevent the flow of blood in fresh wounds, by filling them with this absorbent substance; before a bandage can be applied; 2. To promote the healing of wounds, especially when spread with some digestive ointment, or balsam; 3. For drying wounds and ulcers; 4. To keep them open, in order that the lips may not close before the interior part is perfectly healed; and, lastly, to preserve wounds from the hurtful influence of the air. Trifling as lint may appear, it is an article of considerable utility, and with which every family should always be provided, to serve in case of sudden emergency.

LIPS, in anatomy, are the exterior edges or extremities of the mouth.

Lips are subject to few disorders deserving notice, excepting that called the *Hare-lip*, in which the upper part of the mouth is cleft, or slit, in a manner similar to that of a hare.

Chapped, or sore *lips*, may be healed by the frequent application of honey-water, and protecting them from the influence of cold air.

LIQUID: fluids have been divided into two classes, viz. those which are elastic, and the non-elastic, or those which do not sensibly diminish in bulk when subjected to pressure. The first class are airs or gases: the second liquids: hence we may define a liquid to be a fluid not sensibly elastic, the parts of which yield to the smallest pressure and move on each other.

LIQUOR, a general name for any liquid preparation, but more particularly applied to such as are either fermented, or distilled: of the former class are, beer, ale, wine, &c.; of the latter, are brandy, gin, rum, and other ardent spirits.

LIQUOR of *flints.* Alkalies have a powerful action on silica: they combine in different proportions: two or three parts of potash, with one of silica, give a compound, which is deliquescent in the air, and soluble in water: this was formerly distinguished by the name of liquor of flints, but it is now denominated silicated alkali.

LIQUORICE, *Glycarrhiza glabra*, is the root of a perennial plant with winged leaves, and purplish butterfly-shaped flowers, which grows wild in the south of Europe, and in England, is cultivated near Pontefract in Yorkshire, Worksop in Nottinghamshire, and Godalming in Surrey, and by many gardeners in the vicinity of London.

The stalks of the liquorice plant are usually four or five feet high. The leaves are winged, the leaflets egg-shaped with an odd one at the extremity. The flowers grow in long spikes from the junction of the leaves and branches. The roots are long, round, tough, of brown colour externally, and yellow within.

The principal use of Liquorice is in medicine. It contains much saccharine matter, joined with some portion of mucilage; and is one of the few sweet substances which tend to allay thirst. Liquorice is an excellent medicine in coughs and hoarsenesses. When boiled in a little water it gives out nearly all its sweetness; and this, when the moisture is evaporated, produces, by different processes, what are called *Spanish liquorice, liquorice cakes, liquorice lozenges, and Pontefract cakes.* The former of these is used to great extent in the brewing of porter. It is said that more than two hundred tons weight of it are annually manufactured in Spain, a considerable portion of which is sold to the London brewers for this purpose. Liquorice powder, which is used in medicine, is often adulterated with flour, and probably also with less wholesome articles. The root itself may be employed as stopples for beer or wine bottles; which are considered by some persons more wholesome, as well as more durable, than those of cork.

This plant is propagated by cuttings of the fibres that issue from the parent root, near the surface of the earth they should be divided into sets of six or eight inches in length, each having, at least, one good bud or eye, and planted in February, or in the beginning of March. A light, sandy, and very deep soil should be selected, well manured, and dug three spades deep. The sets ought to be put in the ground by means of a line and dibble, at the distance of 12 inches, in rows with their tops about an inch under the surface; and the rows should be a foot and a half distant from each other.

In three years after planting, the roots of the liquorice will be sufficiently large, and may be taken up between the months of November and February; for this operation should neither be commenced before the stalks are fully decayed, nor delayed till late in spring; in which latter case, the roots are apt to shrivel and diminish in weight. Hence, it is advisable to sell them almost immediately after they are removed from the field. They are vended to the druggists at from 20*s.* to 30*s.* or 40*s.* per cwt.; and an acre of good land produces 3000 roots and upwards; so that the produce has sometimes exceeded 60*l.*

The common liquorice is cultivated in most countries of Europe, for the sake of its sweet mucilaginous root: but that of British growth is preferable to the foreign, which is generally mouldy when it arrives; as this vegetable, unless preserved in a dry place, is remarkably liable to such corruption. In order to extract the juice, the Italians first cut the root in pieces, then moisten and crush it in a mill; thus it is formed into a mass similar to dough, which is boiled for eight hours, and occasionally supplied with water. Next, it is twice pressed, so that all the mucilage may be completely separated: in this state it is slowly evaporated in another cauldron for twenty-four hours, or such time as is required to reduce it to a proper consistence. When cool, it is cut into cakes, either of a square or cylindrical form, and packed in chests with bay-leaves.

LIRIODENDRON, *tulipifera*, or Tulip bearing poplar, tulip-tree, American poplar, white wood. A native and well known tree, in the United States. It attains to a very large size, rising as high as any forest tree; and makes a beautiful appearance when in flower, about the middle of May. There are two varieties, the yellow and the white: both of which afford excellent timber. The yellow is soft and brittle; the white is hard, tough, and heavy. The bark of the root has long been employed by medical men, and others in the United States, as a *tonic;* and when joined with various proportions of black alder, (*prinos verticillatus*) and dogwood, (*cornus florida*) has afforded a remedy of equal efficacy with the Peruvian bark. It is strong, bitter, and considerably aromatic; a decoction of it is said to be a common remedy in Virginia for botts in horses; the powder, combined with steel-dust, is an excellent remedy in cases of general debility, or relaxation of the stomach. For a more particular account of the analysis and virtues of this medicine, the reader is referred to two papers in the *Amer. Museum*, vol. xii. by Drs. Young and Clayton, to another by Dr. Rush, in the *Transactions of the College of Physicians of Philadelphia*, and lastly, to one in a late volume of Tilloch's *Phil. Magazine.*

LITERARY PROPERTY, is that right which an author justly claims in his original literary compositions: so that no person may, without his permission, either publish the work, or receive any profit from the printed copies.

The question relative to literary property has only within these few years been conclusively settled.

The right of *abridging books* is, therefore, established both by reason and the customs of trade. Independently of the copy-right naturally inherent by the common law, the statute 8 Ann. c. 19. declares the whole liberty of printing and re-printing a work, to be vested in an author, and his assigns, for the term of *fourteen years*, and no longer: such property is also protected by additional penalties and forfeitures. By the same statute it is farther enacted, that if an author be living at the expiration of that period, his original interest shall revert to him for a similar term of years.

LITHARGE, or *Lithargyrum*, a preparation of lead consisting of soft flakes of a yellowish or reddish colour. It is obtained by exposing calcined lead to a brisk fire, sufficiently strong to melt it into an oil; which, on cooling, concretes into a flaky matter. Thus, according to the different degrees of heat, it assumes a pale or deep red colour: the former is generally called *litharge of silver;* and the latter, *litharge of gold.*

This preparation is of extensive utility for roasting gold, silver, or copper ores, as it liquefies all earthy and extraneous matters into glass, and thus the metal is more easily separated. Litharge is also employed by potters, for glazing their wares (though such vessels are unwholesome, see p. 243 of this vol.) and likewise in the composition of certain glasses; because it is not only fusible in itself, but contributes to the fusion of other substances. Lastly, it may be revived into lead : and thus considerable quantities, which are produced by refining metals, are again converted into their original form, by melting them upon burning coals.

Litharge plaster is prepared by boiling two parts of olive-oil with one part of litharge, over a moderate fire; adding water, and constantly stirring the mixture, till the two former are duly incorporated. This composition, which was formerly called *Diachylon*, is usually apblied in excoriations of the skin, slight wounds, &c. Its action is so far beneficial, as it keeps the injured part soft, and somewhat warm, while it excludes the external air; though such plaster ought to be employed with due caution.

LITHOGRAPHY, or the ART OF PRINTING WITH STONE, originally discovered in Germany about nine years ago, and which has since been successfully practised in Italy and France, appears to be but little used or even known in this country; though meriting, from its simplicity, its expedition, and its economy, to rank high among modern discoveries, and offering some real and important advantages to the arts. Its inventor was ALOIS SENEFELTER, a native of Prague, in Bohemia, who first obtained, in 1801, an exclusive privilege for the exercise of it from the then elector of Bavaria; and in 1803, a like privilege from the emperor of Austria. SENEFELTER in consequence established stone printing houses at Munich and at Vienna; and under his directions similar establishments have been formed in France and Italy. It is at Munich, however, that the art has been brought to the greatest perfection.

There are three different methods of printing with stone, namely, the method in relief (most generally used) and particularly adapted for music; the hollow method preferable for engraving; and the flat method, which is neither hollow nor in relief, but which is very useful for the imitation of chalk and other drawings. To print or engrave according to this process, a slab of inverrated marble, or any other calcareous stone, is used, provided the stone can be easily cut, and takes a good polish. These stones may thus be compared to the copper plates or wooden blocks, for which they are indeed substituted. They ought to be from two inches to two inches and a half thick, and of a size proportioned to that of the work which it is meant to engrave upon them. When the stone is dried and well polished, the next operation is to draw the design, notes, or letters that are intended to be printed upon it, with a pencil, and afterwards retrace the pencil marks with an ink made of a solution of gum lac in pot-ash, coloured with lamp black produced from burning wax. In about two hours, the letters or musical notes, impregnated with the ink, will be dry, when there is passed over them nitric acid (aqua fortis) more or less diluted according to the relief or hollow which it is desired to form upon the stone. The acid attacking all parts of the stone but those which have been impregnated with the resinous ink only, the notes or drawing remain untouched. The slab of marble is then washed with clean water, and a printer's ball is charged with an ink analogous to that used in other kinds of printing, and being pressed by the hand only, the letters or notes take the ink from the ball, so that they are found to be properly coloured.—After this, a sheet of paper being put in a frame, the latter is lowered, and an impression is obtained by a brass cylinder being passed over the paper : or a copper-press may be used. At each proof it is necessary to wash the plate with water.—When the intended number of copies are printed, and there is no farther use for the work, the stone is polished again, and thus the same slab will, according to its thickness, serve for forty or fifty different works.

The hollow method does not differ greatly from the method in relief, except that the nitric acid is made to act stronger upon the stone, so that the letters are more relieved, and the stone itself much hollower : stronger and heavier rollers are likewise requisite.

The flat method requires less nitric acid than either of the other two, and great care must be taken that the stone prepared for this purpose is quite flat.

The kinds of work that are engraved on stone are the following : imitations of wood cuts, imitations of dot manner, drawing, musical works, all kinds of writing, geographical maps, and engraving in mezzotinto

The advantages resulting from the manner of printing or engraving described above, are, that it has a peculiar character which cannot be imitated by the other methods of printing, and that it can easily imitate any of the former. But its greatest advantage is, the quickness with which it may be performed. A design which an artist could not finish upon copper in the space of five or six days, may be engraved upon stone in one or two days. While the copper-plate printer draws off six or seven hundred impressions, the printer from stone, can take off in the same space of time, two thousand impressions. An engraved copper-plate will seldom yield one thousand impressions, but the stone slab will yield several thousand, and the last will be every whit as good as the first. It has been tried in the stone printing office at Vienna to take off thirty thousand impressions of the same design; and even then the last impression was nearly as handsome as the first. They have even carried this number of copies to a greater extent in printing bank notes. The most industrious and most skilful engraver of music can hardly engrave four pages of music on pewter in a day, while the engraver on stone may engrave twice as many in the same time. Every kind of work which artists engrave upon copper or pewter, and which the printer executes with moveable types, may also be performed by using stone. Our limits will not permit us to enter into all the details of the expense of this method of printing; but experience has shewn, that it may be performed, with a saving of one third of the expense in comparison of the printing upon copper or pewter.

This invention has been introduced into the office of the commander in chief of the British army, with a fair prospect of answering all the purposes of its introduction.

The London "*Annals of Philosophy*" for May, 1818, contains the following "Observations on the method of PRINTING UPON STONE, and on the composition of the Ink; taken from the *Journ. de Pharm.* March, 1817."

Any calcareous stone, which is compact, with a fine and equal grain susceptible of being polished with pumice, and capable of absorbing a little moisture, may be employed for lithography. It was supposed, for some time, that the stones used at Munich alone possessed the necessary properties; but suitable materials have now been found in many of the departments of France. Among others, there are strata of calcareous stone in the mountains which separate Ruffec from Angouleme, which are well adapted for this kind of work.

In order to compose the ink, a vessel varnished and luted on the outside, is warmed; when it is warm, we introduce one part by weight of white Marseilles soap, and the same quantity of pure mastic. These substances are melted and carefully mixed together; five parts by weight of shell lac is then incorporated with them, by stirring them together until the whole is completely united, and there is then gradually added a solution of one part of caustic soda, in five or six parts its bulk of water. This addition must be made cautiously; for if the alkaline ley be poured in all at once, the liquor would froth up, and rise above the sides of the vessel.

When these substances are completely mixed together, by employing a moderate heat and the agitation of a spatula, the necessary quantity of lamp black is added, and immediately after as much water as is sufficient to render the ink fluid and in a proper state for writing. The ink is applied to the stone as it would be to paper, either by a pen, or a pencil. When the design or writing is dry, and we wish to print from it, water acidulated with nitric acid, is employed, in the proportion of fifty parts of water to one of acid; by means of a sponge the surface of the stone is soaked with this water, taking care not to *rub* the ink lines, this process is repeated as soon as the stone appears to be dry. An efferverscence is produced, and when it ceases the stone is gently washed with pure water.

While the stone is in this state, and still moist, printer's ink is applied to it, with the common apparatus, which only adheres to the parts that are dry. A sheet of paper, properly prepared to receive the impression, is then laid upon the stone, and the whole is subjected to the action of the press, or the cylinder. To retain the design upon the stone and to preserve it from dust, when it is not used immediately after being prepared, it is covered with a stratum of a solution of gum arabic, and this varnish is removed by water, when we wish to print from the stone.

Instead of ink, a peculiar kind of pencil is sometimes employed to draw upon the stone or upon paper, from which a counter impression is taken on the stone. The pencils are composed of the following ingredients melted together; three parts of soap, two parts of tallow, and one of wax: when the whole is melted, and well mixed, we add lamp-black, until the colour be sufficiently intense; the fluid is then run into moulds, where it becomes solid as it cools, and acquires the consistence necessary for the formation of pencils.

Further Observations on Lithography.

The following particulars are for the most part, extracted from a report on this interesting art, made to the Royal Institute of France, *Journal de Physique* for February 1817.

Alois Senefelter, a chorus singer at the Theatre of Munich, was the first who observed that certain calcareous stones have the property of contracting an intimate adhesion to characters traced on their surface with thick oily ink, and that if the stone was afterwards moistened, and then dabbed with printer's ink, an impression of the characters might be transferred to paper. In 1800 he obtained from the King of Bavaria a patent for his process, and first applied it to printing music. The history of the further progress of this art is foreign to the object of the present notice.

The only stone hitherto discovered which completely answers the purpose, is a compact, nearly pure carbonate of lime, of a greyish white colour. At Solenhofen, near Pappenheim, in Bavaria, are extensive quarries of it; also at Kehlheim, near Ratisbon, at both which places it has for many years been raised, and made into clay-stones for floors and hearths, &c. an application to which it is well fitted by its easily splitting into lamina of the required thickness and area, and by the facility with which it is brought to a smooth surface. It is supposed to be the same rock, geologically speaking, as the *white lias*, a calcareous flag-stone which is found in England covering the blue or common lias limestone. But I believe that specimens of the requisite hardness and fineness of grain have not hitherto been discovered in this country. The stones are first brought to an even surface by rubbing them against one another, and are then finished with fine sand and pumice stone.*

The ink is composed of soap, and of rosin, and gum lac, dissolved in a solution of caustic soda; to which is to be added a proper quantity of lamp-black: the above ingredients, after being intimately mixed by trituration, are to be diluted with warm distilled water to the consistence of a thick ink, which is then ready for use. The same ingredients being exposed to a gentle warmth, at length dry into a mass, which being put into a wooden case, may be used as chalk or crayon. It is difficult to find a pen which, when charged with this ink, will draw lines sufficiently fine for delicate work, and therefore the brushes &c. of the minature painter should be had recourse to.

They who are accustomed to the fine handling required in pen and ink drawing, will, with due care, produce the best specimens of lithography. The design being drawn on the stone, either with the fluid ink or with the crayon, the whole surface is to be floated with water acidulated by nitrous acid, in order to remove any greasiness, and is then ready for use.

Another variety in the practice of this art is to bring the surface of the stone to a fine polish, and then to cover it with a varnish of gum and lamp-black. The design is etched in by cutting through the varnish by means of a needle and other proper instruments, after which the prepared ink is applied with a brush, and insinuates itself into the places where the varnish has been cut through. The stone is then placed on its edge in warm water, the varnish loosens and falls off, and the traces filled with the prepared ink alone remain. This process has been found useful for maps, and other works, in which very fine lines are required; the varnish however, is so much harder than that in common use among engravers, that some practice is necessary before the artist can employ the requisite degree of force. It appears probable that by mixing treacle with the gum, the consistence of the varnish might be materially improved.

The effect of wood engraving is given very perfectly by covering the entire surface of the stone with the prepared ink, and then scratching it off in the parts intended to be white.

The method practised by M. Engelman, of taking off the impression, is as follows:

The press consists of a hollow table terminated at one end by an upright frame supporting a roller, which, by means of a winch, may be made traverse along the table from one extremity to the other. The stone is laid perfectly horizontally in the hollow of the table, and is secured in its place by means of wedges. It is then moistened with a sponge dipped in pure water till it refuses to absorb any more. A wooden roller covered with leather and charged with very fine engraver's ink, is then passed two or three times over the surface of the stone, and adheres to all the lines made with the prepared ink, and to those only. A sheet of paper, not so damp as is required in copper-plate printing, is next laid carefully on, a board is placed about it, and then, by turning the winch, the roller exerting a pressure of more than 1000 lbs. passes slowly over the surface of the board, and the process is finished by removing the board and taking out the print thus produced. It is necessary to take about a dozen proofs before the work comes to its full perfection. After a number of impressions have been taken, the more delicate parts will begin to be a little blurred. As soon as this is perceived, remove the stone from the press, and first pass over it a sponge filled with rectified oil of turpentine, and then wash it well with pure water. By this treatment the whole design will be apparently discharged; this however is not the case; far on passing the roller charged with ink, over the surface of the stone, every line, even the most delicate, which was in the original drawing, will again become visible, and the printing may be proceeded with as at first.

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* This stone is found in great abundance in Kentucky, of which specimens have been brought to Philadelphia by Mr. Clifford, of Lexington, and compared with the stone from Munich to which it is found to be similar.

The best specimens of *writing and drawing on stone*, are from Vienna. Mr. Dobson, jr. has presented the American Philosophical Society with some of these, equal to any engraving, and also a specimen of the stone prepared by grinding it smooth, and then roughing it with fine sand or emery, just as the glass shades and glass moon lights are done.

But it should appear as if any smooth surface will answer.

M. Laugier having analysed the composition of which the crayons are made, finds in 10 parts, the following proportions, viz. Wax 15: Wax combined intimately with grease or suet 21: suet 25: Rosin or Mastic, 26: black colouring matter 6: loss by adhering to filtres, &c. 7 parts. In all 100.

The ink used is made of nut oil: the best methods of gathering the walnuts and making the oil, are to be found in the second half volume of Michaux's North American Sylva, p. 146: the method of making with it ink for copper-plate printing is in page 148. For light colours, this oil is reduced to two thirds of its bulk; for dark colours to one-fifth, which leaves it a thick semi-fluid substance. To facilitate the process, one-tenth of linseed oil is added, and it is then placed in an iron or copper vessel, over an active, clear, charcoal fire. When it begins to boil rapidly the vessel is uncovered, and the oil takes fire, or is set on fire, and burns till it is reduced to a proper consistency, sometimes it is not allowed to kindle, but when ebullition commences, crusts of bread are thrown in, which collect and absorb a part of the mucilage of the oil. The nut oil thus prepared, preserves its tints longer than linseed oil, and the back of the copper plate prints do not become brown. Instead of lamp-black (which when meant to be used, should be burnt over again in close vessels,) Frankfort black is employed, made by burning wine lees in close vessels.

The ink is conveyed to the stone by means of a roller, on which it is very evenly spread: the roller is covered with buff leather rubbed down smooth so as to have no down or furze on it. The impression is made by a forward and backward stroke of a smooth stone or polished glass, fixed at the end of a piece of stick, which is fixed at the other end to a joist of the ceiling; in fact, the machine used by the persons who glaze or polish printed calicoes.

[A composition as a substitute for the stone may be made, by setting burnt plaister of paris in a mould with a solution of alum.—T. C.]

[Lithography.(*Additional.*) The stone may be any compact lime-stone: the secondary lime-stones seem best. Where the ground is not required ro be eaten down with a diluted acid, (such as 50 parts water to one of nitric or muriatic acid,) gypsum will answer. Where the impression is wanted to be strong and bold, it is better to use a lime-stone, and eat away with acidulated water.

To make the ink, they use in Germany,

White soap, 1 part.
Mastic in drops, 1 part.
Melted carefully together in a glazed vessel.

Shell lac, 5 parts: continue to stir it over the fire. Then add, by degrees, 1 part of caustic soda dissolved in six parts of water, stirring it at each addition, to prevent its boiling over. Let the heat be moderate, and add, gradually, lamp-black enough to colour it fully: then dilute with water, while over the fire.

Draw with this ink, and then, when dry, moisten the surface of the stone with water: then with a printer's ball daub it gently with common printers' ink, or the ink used by copper-plate engravers, and take an impression by means of a wooden cylinder, covered with buff leather The impression may be preserved when the stone is put away, by covering the surface with a solution of gum arabic, which can be washed off with care.

The Crayons are made thus:

White soap,	3 parts.
Suet,	2 parts.
Wax,	1 part.

Melt gradually; stir frequently; then add as much lamp-black as is necessary to colour it. Run it, while warm, into moulds.

A better recipe is:

Asphaltum, 3 parts.
Suet and wax, each ½ a part.
Lamp-black to give colour.

The crayon should be of sufficient consistence to enable you to cut it to a fine point without breaking. The first of these recipes will make it too soft, and seems to require 2 parts of mastic.

The design may be traced (on paper prepared by a solution of gum arabic) with a greasy crayon, such as the first recipe above mentioned, and then transferred from the paper to the stone.—T. C.]

LITHONTRIPTICS. See STONE.

LIVER, the largest and most ponderous of the abdominal viscera, which in adults, weighs about 3 lbs. It is situated under, and connected with the diaphragm, by means of the suspensory and other ligaments; extends over the right side of the stomach, and serves to purify the blood, by secreting the bile.

The liver of animals affords neither wholesome nor palatable food. The blood-vessels and biliary matters connected with this organ, render it still more objectionable, especially to plethoric persons. From its dry and earthy nature, it corrupts the chyle and obstructs the vessels: hence it requires a great quantity of drink, and ought to be eaten only by the robust, whose powers of digestion are unimpaired.

OBSTRUCTION OF THE LIVER, a disease in which the blood is apt to stagnate, and form congestions in that viscus. Its symptoms are, difficulty of breathing, an irregular heat in the whole body, dry cough, loss of appetite, and a straitness about the region of the heart: the urine is at first thin and limpid; but as the hectic fever increases, it assumes a deep orange-colour, and, at length, deposits a thick sediment. This complaint chiefly affects persons of sedentary occupations, or those whose natural discharges are suddenly obstructed, and such as use too gross a diet, or indulge in too long repose on feather beds.

Cure: Blisters applied to the region of the liver; emetics; mercury, used both externally and internally. Considerable benefit has also been derived from the use of gum ammoniac, in the form of an ointment, with oxymel of squills, and the application of emollient clysters; from the extract of the Common Hemlock, prescribed according to circumstances, and last, but not least, from regular exercise on horseback. The patient's diet should be light and nourishing.

INFLAMMATION OF THE LIVER, or *Hepatitis*, a most dangerous and frequent disorder in hot climates: it is accompanied with tension and pain in the right side, under the false ribs; a difficulty of breathing, and lying on the left side; dry cough, vomiting, hiccough, and loathing of food.

The more immediate causes of this affection are, indurations, or hard tumours of the liver; too great fatness in the *omentum* or caul; sudden exposure to cold air, or the drinking of cold water, when the body is over-heated; violent concussions occasioned by too powerful emetics, &c.

In this, as in other inflammations of the viscera, recourse must be first had to blood-letting, which should be repeated according to the nature of the case; a blister is then to be applied to the part affected; mercurial purgatives, together with emollient and attenuating clysters, are next to be administered, and a gentle salivation, raised either by the external or internal use of mercury The abdomen and legs ought also to be frequently bathed in warm water. Lately, the nitrous acid, largely diluted with water and mucilage, or syrup, has proved almost a specific in chronical affections of the liver in the East Indies; but this medicine cannot safely be taken, without medical advice. The diet and regimen to be observed by such patients, we have already stated under the article INFLAMMATORY FEVER.

LIVERWORT, or *Lichen*, L. a genus of perennial plants, comprising 363 species, the greater number of which are natives of Britain; the most remarkable of these are:

1. The *calcareus*, Calcareous, or Black-nobbed Dyers' Liverwort, which grows on lime-stone rocks in the North of England and Wales, and is in flower from July to December. This species is so peculiar to lime stone rocks, that wherever these are found among other soils, they may immediately be distinguished by the appearance of this plant. When dried, pulverised, and steeped in urine, the calcareous liverwort is employed by the Welch, and by the inhabitants of the Orkney Islands, for dyeing a brilliant scarlet colour. It should be gathered in August, completely dried, then reduced to powder, and steeped in urine for three weeks, in a close vessel.

2. The *parellus*, or Craw-fish-eye-Lichen: it grows on rocks, walls, stones, and on the trunks of trees; flowers from January to December. This vegetable abounds on the rocks in the North of England, where it is collected, and sent to London in casks. It imparts a red colour, and is used in making the blue pigment, known under the name of *litmus*.

3. The *tartareus*, or Large Yellow-saucered Dyers' Liverwort, which abounds in the Highlands of Scotland, and in the county of Derby: it incrusts most of the stones at Urswick-Mere, and is in flower from January to December. In Scotland, this species is gathered, cleaned, and, after being steeped in urine for the space of three months, it is formed into cakes; which, when dried, are pulverised, and employed for imparting to wool a fine scarlet colour, with the addition of alum. In England, it is collected and sold at the rate of one penny per pound, to dyers for striking a purple dye.

4. The *omphalodes*, or Dark-coloured Dyers' Liverwort, Cork, Corker, or Arcell, which grows on rocks in several parts of Britain, and flowers the whole year. It is prepared in the same manner as the preceding species: with the addition of lime, and a little salt, it imparts a reddish-brown to woollen cloth; which, if it be afterwards dipped in the blue vat, will acquire a beautiful purple tinge. The dark coloured liverwort is an useful *styptic:* it was formerly reputed in inflammatory fevers, cutaneous affections, and disorders of the liver; but it is now justly exploded.

5. The *vulpinus*, or Gold-wiry Lichen, is found on the trunks of old trees, in various parts of Britain, and flowers during the whole year. It communicates a yellow colour to yarn; and, when mixed with pulverised glass, is strewed on carcasses in Norway, to destroy the wolves which infest that country.

6. The *prunastri*, or Common Ragged Hoary Liverwort, which grows on the trunks and branches of trees, and is in bloom from January to December. This species possesses the remarkable property of imbibing and retaining odours; on which account its leaves, when pulverised, form the basis of several perfumed powders: they also communicate a red colour to yarn.

7. The *caperatus*, or Wrinkled Liverwort, which abounds on the surface of rocks, stones, trees, and pales; it also flowers throughout the year. In Ireland, and the northern parts of the Isle of Man, it is employed for dyeing wool of an orange colour. If serge be previously infused, and boiled in urine, or steeped in a solution of green vitriol, and then dyed with this plant, it will assume a fine russet-brown tinge; but, if it be simply immersed in a decoction of the wrinkled liverwort, the stuff will acquire a lemon shade.

8. The *pustulatus*, or Spotted Liverwort, which is found on rocks in Wales, and the northern parts of Britain; it flowers during the whole year. According to LINNÆUS, a beautiful red colour may be prepared from this species; and Dr. WITHERING states, that it may be converted into an excellent black pigment.

9. The *calicaris*, or Beaked Liverwort, grows sometimes upon trees, but more frequently on rocks, near the sea-coast. It is smooth, glossy, and whitish, producing flat or convex shields, very near the summits of the segments, which are acute and rigid; and, being often reflected by the growth of the shields, appear under their limbs like a curved beak. This plant yields a fine red colour; and, in this respect, promises to become a substitute for the famous *Lichen Roccella*, (see ORCHAL, which is imported from the Canary Islands, and sometimes sold at the price of 80*l.* per ton.) Both the present and the preceding species (*Lichen pustulatus,*) were formerly employed instead of starch, in the manufacture of hair-powder.

10. The *aphthosus*, or Green Ground-Liverwort; it grows on moist rocks, in shady, stony, and moist places, and,

like most of the preceding species, it flowers from January to December. An infusion of this plant is made in milk, and given by the country people to children affected with the thrush. A decoction of it, in large doses, operates powerfully both as a purgative and as an emetic; it is said to be a good vermifuge

11. The *Islandicus*, or Esculent Iceland Liverwort, abounds not only in the Highlands and Lowlands of Scotland, but is also found in some of the more northern parts of England and Wales. The inhabitants of Iceland boil this beneficial plant in several waters, then dry, and make it into bread. They likewise prepare from it a kind of gruel, which is mixed with milk; but the first decoction is never used; as it is strongly purgative. A jelly, or thick mucilage made of the Iceland Liverwort, is recommended by Heller and Scopoli, as an excellent domestic remedy in consumptions. In Germany, a very durable brown dye is obtained by first boiling linen yarn, for one hour, in a solution of alum and cream of tartar; then adding to this liquor the dried Iceland Liverwort, and suffering it to boil for half an hour at the least, when the yarn is again to be immersed for a quarter of an hour or longer, stirring it properly, and afterwards plunging it in a weak, cold solution of copperas or vitriol of iron. But the Iceland Lichen also imparts a very excellent black to white woollen yarn, by previously boiling it for one hour in a liquor made of the dried plant, and an equal quantity of copperas, in pure water; then removing it from this brown dye, and again boiling it for fifteen minutes in a strong decoction of log-wood: thus the wool assumes a deep black colour, which presents no other shade.

12 The *pulmonarius*, Lung-wort-Liverwort, Hazel Rag, or Hazel Crottles, which abounds on the trunks of old trees, especially those of oaks, and on heaps of stones in moist shady situations. It has an astringent, bitter taste; and is used in Siberia as a substitute for hops, though it renders the ale narcotic, and occasions the head-ach. This plant was formerly much esteemed in consumptive cases. According to Dr. Rutty, woollen cloth dyed with the lungwort, acquires a durable orange colour.

13. The *caninus*, or Ash-coloured Ground Liverwort, which grows upon the ground among moss, at the roots of trees in shady woods; and is frequently found on heaths, stony places, and in hedges: it is in flower throughout the year. This species has acquired its celebrity by Dr. Mead's assertion, that it is an infallible preventive of the consequences arising from the bite of a mad-dog. *It is, however, to be regretted, that this medicine has but seldom, nay,* NEVER, *proved effectual.*

14. The *cocciferus*, or Scarlet-bearing Liverwort, which is common on heaths, and flowers from October to April. This species assumes various appearances, according to its age, situation, and other circumstances affecting its growth. It may, however, be easily distinguished by the fungous tubercles, which are of a beautiful scarlet tinge, and grow on the top of its stalk. These excrescences, when steeped in a solution of potash, are said to impart a fine and durable purple.

15. The *plicatus*, Officinal Stringy Liverwort, or tree-moss, which grows on the branches of trees in thick woods, and is in flower from January to December. It was formerly used as an astringent to prevent hæmorrhages, and to cure ruptures. Linnæus observes, that the Laplanders successfully apply the tree-moss to their feet, with a view to relieve the excoriations occasioned by too great exercise. Professor Kalm remarks, that if this vegetable be collected from fir or birch trees, it communicates a green colour to wool, previously boiled in alum-water.

16. The *barbatus, v. articulatus*, or Bearded Liverwort, thrives in woods, and on the branches of trees; flowering throughout the year. It grows from half a foot to two feet in length, is of a whitish-green cast, and possesses considerable astringency. When steeped for some time in water, the whole plant acquires a red-orange colour, which is employed by the inhabitants of Pennsylvania to impart that tinge to various stuffs.

17. The *Roccella*. See Orchal.

It is remarkable, that the *lichens*, or mushrooms, cannot be propagated by seed; and that, with these fungous productions, there appears to commence a new and intermediate kingdom, partaking both of vegetable and animal nature: so that the generation of fungi seems to be involved in a process of fermentation, which suddenly assumes a vegetable form.

All the indigenous species of the lichens contain a considerable portion of viscid matter; which has, by the Earl of Dundonald, been successfully converted into a gum, possessing all the properties of the SENEGA, at present used by calico-printers. These vegetables abound chiefly on trees, growing in poor stiff soils: they attain to maturity in three or four years; so that a crop may be taken from the same tree, every fourth year.

The liverwort is furnished with an external skin, beneath which is found a green resinous substance: the remainder is composed partly of gum, and partly of an animal fibrous matter, that is insoluble both by heat and the action of alkalies. In order to extract the gum from such plants, they are first scalded two or three times in boiling water; in consequence of which, the rind or skin is separated, together with the greater part of the resinous ingredient. The vegetables, thus prepared, are next put into copper vessels and boiled, in the proportion of 1 lb. to 2 gallons of water, for four or five hours; half or three quarters of an ounce of soda or pearl-ashes, or half a pint of volatile alkali, being added to every pound. The boiling is continued till the liquor acquires a gummy consistence; when it is strained through a hair sieve, and the residuum is expressed through hair-cloth bags, by means of presses similar to those used by tallow-melters.

The extract thus obtained, is then suffered to stand for 10 or 12 hours; after which it is strained, and evaporated in lead or tin vessels, placed over stoves moderately heated by fuel, or by the steam of hot water, till it be of a proper consistence for block-printing. If such gum, however, be intended for making ink, manufacturing paper, or staining and stiffening silks, crapes, gauze, &c. Lord DUNDONALD observes (in his circular letter addressed to the calico printers of Scotland), that no *alkaline salts* must be employed for extracting the liverwort; and the boiling be continued for a longer time, and with a moderate degree of heat: thus, the gummy extract will become nearly colourless; but, if volatile alkali be used, it will be necessary to substitute *iron* vessels for those made of copper.

Lord D's gum has been found to answer every purpose for which it was designed: as its preparation is not only cheaper, and will produce a considerable saving of money annually sent to Senegal, but will also afford employment to numerous women, children, and others in collecting, as well as in preparing, the lichens, it promises to be a national benefit.

LIXIVIUM, or LEY, signifies a solution of salts or ashes in water, for the different purposes of bleaching, washing, dyeing, &c. Having, in the progress of this work, frequently employed the term *lixivium*, we shall in this place only observe, that a ley may be made either of the vegetable or mineral alkali; that the latter is often found native in some parts of the earth, as well as universally combined with the waters of the ocean; but that the former is uniformly obtained from the ashes of burnt vegetables. Hence a lixivium may be prepared even from straw reduced to ashes, if more substantial plants cannot be procured on the spur of the occasion.

LIZARD, or *Lacerta*, a genus of amphibious animals, consisting of several species; the most remarkable of which is the *Agilis*, or common green Lizard, a native of Britain. It is extremely nimble; and though perfectly harmless, its form inspires general disgust. During the heat of summer, this animal delights to bask on the sides of dry banks, or beneath aged trees; but, as soon as it is noticed, it immediately retreats to its hole. The food of lizards consists of insects, and they are themselves devoured by birds of prey. But, notwithstanding their terrific appearance, these animals are of real service, especially in gardens; and ought by no means to be destroyed, merely to gratify an unnatural and cruel aversion.

LOADING OF GOODS, the act of removing ponderous substances, such as timber, corn, or other merchandise, to a cart or wagon.

Mr. GEORGE DAVIS, of Windsor Co. Berks, England, has invented a portable machine for loading and unloading goods, for which the *London Society of Arts* conferred on him forty guineas, in the year 1797. A plate and description of the machine, may be found in the transactions of the society for the above year.

LOAD-STONE, or MAGNETIC IRON STONE, is a compact blackish kind of iron ore, which is possessed of the power of attracting iron, as well as every substance which contains ferruginous particles. It is betwixt four and five times as heavy as water.

This mineral is found in masses of different forms and sizes in most of the iron mines of Europe and America; and, when submitted to the furnace, it yields a considerable proportion of metal. This makes excellent bar iron, but very indifferent cast iron. In Sweden, and particularly at Roslager, the ore is found quite pure, and the iron that is wrought from it is imported in considerable quantities into Great Britain, for the purpose of being manufactured into steel.

The appellation of load, or leadingstone, has been given to this kind of iron from its magnetic virtues; for it is not only endowed with the property of attracting iron, but also of pointing itself, and even enabling a needle touched with it to point towards the poles of the world. We are, however, entirely ignorant what is the cause of this very extraordinary property.

Artificial magnets, constructed of steel, possess all the essential virtues of the genuine load-stone, and these even in a much higher degree. The natural magnet is consequently now little esteemed except as an object of curiosity.

LOAM, in agriculture, any species of earth, less cohesive than clay, but more compact than chalk.

There are several varieties of *loam;* the most common of which we shall enumerate.

1. The *clayey*, that is likewise called *strong*, *stiff*, *cold* and *heavy* loam: it consists of a mixture of clay and coarse sand; is distinguished by the name of *Windsor loam*, and is much used for making bricks, building furnaces, &c.

2. The *chalky* loam; the constituent parts of which are chalk, clay, and coarse sand.

3. The *sandy* loam, consisting of the same ingredients as the preceding kind, though the sand prevails in a larger proportion. The two latter varieties are frequently blended, and compose what is called a *deep crumbly* loam. This was formerly supposed to be unfit for vegetation, till it had been exposed for several years to the influence of the sun, air, frost, &c. Experience, however, has evinced the contrary; and it is certain, that though the vegetative powers of this *barren earth* (as some have disdainfully called it) remain latent for a longer time than in soils which have undergone a proper degree of fermentation; yet, after its surface is broken up and properly stirred, it will, at the expiration of *one* year, be well adapted to the production of crops.

A deep crumbly loam is particularly calculated for the growth of fruit-trees; and, if it be laid in ridges during one winter, and the succeeding summer, it will afford ample nourishment to such trees; even though it should have been turned up from the depth of 6 feet in the ground.

Lob-grass. See **Brome-grass**, the Soft.

LOBSTER, or *Cancer*, L. a genus of insects comprising 20 species: the principal of which is the *grammarus*, or Common Lobster: it has a smooth breast, four pair of legs, six joints in the tail, and rounded train-fins.

These creatures inhabit the clearest water, at the foot of rocks that impend over the sea. They are brought in vast quantities from the Orkney isles, and several parts of the eastern coast of Scotland, to the London markets. Being extremely prolific, they begin to breed in the spring, and continue to spawn during the greater part of the summer. Dr. Baster counted 12,444 eggs under the tail of one lobster, beside those which remained in the body unprotruded: after being deposited in the sand, these embryons are soon hatched.

Lobsters change their shell annually, and acquire a new one in a few days: like crabs, they will renew their claws, if deprived of them by accident. These shell-fish are remarkably voracious, feeding on sea-weeds, garbage, and all sorts of carcass.

Few lobsters are taken by the hand; as the greater number are caught in *pots*, or a kind of trap constructed of twigs, baited with garbage, and formed similar to a wire mouse-trap, so that the insect, after entering it, cannot escape. Such machines are fastened to a cord sunk in the sea, and the place is marked by a buoy. In summer, they are found near the shore, and thence to about six fathoms deep; but, in winter, they are seldom taken in less than twelve or fifteen fathoms of water.

Lobsters continue to grow in size only while their shells are soft. Those selected for the table, ought to be heavy in proportion to their size, and be furnished with a hard crust on their sides, which, when in perfection, will not yield to moderate pressure. Barnacles, and other small fish, adhering to them, are considered as certain signs of superior quality. The male lobsters are, in general, preferable in the winter, and may be distinguished from the female, by their narrow trains, and a strong spine upon the centre of each transverse prominence beneath the tail.

The meat of a lobster is not easy of digestion. Sometimes, the immoderate use of lobsters is attended with eruptions of the erysipelatous kind in the face, or a species of nettle-rash over the whole body; either of which, being salutary efforts of nature to expel noxious matter, are more troublesome than dangerous.

LOCK, a well-known contrivance for fastening doors, chests, or the like; and which is generally opened with a key.

From the different structure of locks, adapted to various purposes, they acquire different names. Those fixed on outer doors, are called *stop-locks;* those on chamber doors, *spring-locks;* and such as are affixed to trunks, are known by the name of *padlocks, trunk-locks,* &c. Of these, the spring-lock is the principal, both on account of its more general utility, and for the curious intricacy of its structure. Its chief constituent parts are, the main-plate; cover-plate; and pin-hole: to the first belong the key-hole, top-hook, crosswards, bolt-toe, or bolt-knap, draw-back spring-tumbler, pin of the tumbler, and staples. With the cover-plate are connected a pin, main-ward, cross-ward, and step-ward or dap-ward: lastly, the pin-holes corresponds with the hook-ward, main-cross-ward, shank, pot or beard, bow-ward and bit.

The excellence of locks consists in the security they afford: and as numberless schemes are continually brought forward by designing men, to elude every contrivance of the most ingenious mechanics, the invention of a durable lock, so constructed as to render it impossible for any person to open it, without proper keys, has ever been an object of considerable importance.

In the year 1784, the *Society for the Encouragement of Arts,* &c. conferred their silver medal on Mr. TAYLOR, of Petworth, for his improvement on the latch or spring-bolts of common locks. This is effected by simply reversing the tumbler, so that its curved side acts against two stubs fixed on the tail of the latch, and thrusts back the latter with ease; whether the knob be turned to the right or to the left, when the lock is opened. Mr. TAYLOR has also, behind the tail of the latch, fixed a guide containing a groove, in which runs a small *friction-wheel,* that serves to keep the latch in its direct situation, and at the same time to diminish its friction: the arms of this tumbler are somewhat contracted, in order that the latch or spring-bolt may move with greater facility. By this construction, the parts of the tumbler and latch, which are in contact, move in a line, so that they pass over the greatest space, under the smallest angle; and the lock itself may be constantly used for several years, without requiring the application of oil.

The same Society also granted, in the same year, the sum of ten guineas to Mr. MARSHAL, for a *secret escutcheon,* which, when fixed to a lock, may be so repeatedly varied, that even the artist who made it, is unable to open the lock: as, however, a satisfactory description of its mechanism cannot be given, without the aid of engravings, we refer the reader to the 3d vol. of the Society's *Transactions.*

In June, 1801, a patent was granted to Mr. HOLEMBERG, for his invention of locks or fastenings adapted for general use, on a new and improved construction. The external form of the locks, thus manufactured, corresponds with those in common use: internally, however, an orbicular bolt is substituted for a rectilineal one, the security of which is increased by an inside tumbler that is fastened by a flag spring bolt. The whole manufacture of this lock is remarkable for its simplicity and ingenuity, with which it combines the important advantage of *security;* so that this contrivance justly merits the preference.

Various patents have been obtained for the construction of locks, so as to prevent the possibility of picking them: The principal of these is Mr. BRAMAH's, registered in 1784; and Mr. SPEARS's, in 1795; but, as the account of those would be unintelligible without the aid of several engravings, the curious reader will consult the 5th and 8th vols. of the *Repertory of Arts and Manufactures,* where they are minutely specified.

LOCK, in *inland navigation,* denotes all such works (whether of wood or stone) which are intended to raise the water of a river; but it is more particularly applied to a kind of canal inclosed between two gates, the upper of which is called a *sluice-gate,* and the lower a *flood-gate.* These serve to confine the water, and thus to facilitate the passage of boats, both in ascending and descending the canal.

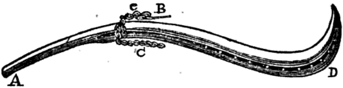
In the year 1791, a patent was granted to Mr. JAMES PLAYFAIR, architect, for his method of constructing the locks of navigable canals on a new principle, and also for improving such as are already erected. With this design a certain portion of water, in the ascent and descent of vessels, is conducted into reservoirs or cisterns communicating with the lock upon different levels, and thus eventually saved; because their apertures may be opened and closed at pleasure, so that only the sixth part is required for the passage of boats. The particulars of this ingenious contrivance are inserted, and illustrated with engravings, in the 3d vol. of the *Repertory of Arts and Manufactures*.

Another patent was granted, in 1798, to Mr. James Fussell, for his invention of a machine or balance-lock, serving to raise or lower boats on canals: an account of which appeared in the 11th vol. of the work before quoted.

Locked Jaw. See Jaw.

LOCKING-POLE, an ingenious piece of mechanism, to be affixed to the wheels of wagons or other carriages, when descending steep hills.

As many distressing accidents happen from carts overpowering the shaft-horse, when proceeding down declivities, Mr. Thomas Colley laid before the Society for the Encouragement of Arts, &c. a contrivance for preventing such casualties; in consequence of which, he was rewarded with their silver medal. The following cut represents this useful invention:



A, The hollow, which lies on the nave of the wheel.

B C, The chains that clip the felly of the wheel.

D, The front part of the pole, shod with iron; and which is farther strengthened by a rib of iron, that is rivetted along its side, as is indicated by the black line, in the cut.

In order to apply this locking-pole, the chain C is put round the felly of the wheel; the pin B is passed through the last link of C, and turned back through the moveable ring *c*: thus the wheel is secured, and any wagon, however laden, may descend the steepest hill with safety.

To prevent the locking-pole from breaking, Mr. Colley directs it to be made of the stem of an ash-tree, the *spurns*, that is, the beginning of the roots of which, have not been cut off in felling. He farther remarks, that if a horse, which has been accustomed to such situation and to descents, be put in the shafts, the animal will be so much inclined to hold back, that it will be extremely difficult to make him draw. This exertion, however, is absolutely necessary; as otherwise the chain-horse, which should always be linked to the locked side, will be obliged to pull an unnecessary weight, occasioned by his being considerably lower than the points of the shafts.

Lastly, in conveying the locking-pole from one declivity to another, it is to be placed between the lower part of the cart and the axle-tree, while the smaller end is to be buckled with a strap fixed under the body of the cart, on the driving side.

LOCUST, or *Gryllus Locusta*, L. a family of insects, natives of Asia and Africa, where chiefly two species are remarkable, namely:

1. The *Shielded Locust*, so called from the pectinal shield covering its breast. It is marked with a greenish hue, but a deeper yellow beneath its body, and the inside of the hind legs is red: it attains the size of a robust man's finger, and is eaten in the East; an instance of which occurs in Scripture, where it is recorded that St. John used this insect as his food.

2. The *Migrating Locust*, which is of a smaller size, has a greyish blue head, yellowish and brown spotted wings above, green ones below, and a reddish belly behind. Its peculiar native soil is Great Tartary, whence these insects have sometimes migrated into Europe, (flying at the rate of twenty-five English miles in a day), and committed extensive devastations in com-

fields. They multiply more speedily than any animal in the creation, but are formidable only in the countries where they breed; being unable to live in cold climates. In the year 1748, a flight of these depredators was seen in Britain, but they fortunately occasioned no damage. In cases of their future invasion, it will be advisable to burn, previously to their approach, such combustibles as emit a thick and offensive smoke; for instance, turf, wet straw, &c. sprinkled with sulphur. An instance occurred many years since, in Germany, where a swarm of locusts was driven from one district to another, by the noise of bells, spades, hammers, and other metallic instruments.

LOGARITHMS are artificial numbers, invented for the purpose of facilitating certain tedious arithmetical operations.

If any series of numbers in arithmetical progression beginning with 0, be taken, and a corresponding series of geometrical numbers, beginning with 1, the former series will be logarithms to the corresponding numbers in the latter; thus;

Logarithms.
0, 1, 2, 3, 4, 5, 6, 7, 8, 9,
Numbers.
1, 2, 4, 8, 16, 32, 64, 128, 256, 512.

Here 0, 1, 2, &c. are the logarithms of 1, 2, 4, &c. and it will be seen at once, 1. That "Addition in logarithms answers to Multiplication in common numbers."

Thus, if the logarithms 2 and 6, are added together, the sum is 8, which answers to the logarithm of 256, the number that is obtained by the multiplication of 4 and 64, which are the numbers standing under the logarithms 2 and 6. By adding the logarithms 4 and 5 we have 9, which stands over 512, the number obtained by multiplying together 16 and 32. Hence the addition of logarithms answers to multiplication in common numbers.

2. "Subtraction in logarithms answers to division of common numbers."

Divide 256 by 8, and you have 32, over which stands 5 = 8 — 3: the logarithms standing above.

3. "Multiplication in logarithms answers to involution of common numbers."

Ex. The square of 8 is 64; now 3 is the logarithm answering to 8, and 3 × 2, (because 2 is the index of the square), is equal to 6, which is the logarithm of 64.

4. "Division in logarithms answers to evolution in common arithmetic."

Ex. 1. The square root of 256 is 16, over which stands the logarithm 4; which answers to 8 ÷ 2, 8 being the logarithm of 256.

Ex. 2. The cube root of 512 is 8; and 9, which is the logarithm of 512, divided by 3, the sign of the cube, gives 3, which is the logarithm of 8.

The same indices will serve for any geometric series; but the logarithms generally used are those which increase in a tenfold proportion, as

0. 1. 2. 3. 4. 5. 6. &c.
1. 10. 100. 1000. 10000. 100000. 1000000.

Here it is evident, that the logarithms of numbers between 1 and 10, are greater than 0, and less than 1, thus the logarithms of 2, 6, 8, &c. are .3010300, .7781513, .9030900, &c.

The logarithms of the numbers between 10 and 100, are greater than 1, and less than 2; thus the logarithm of 15 is 1.1760913, and the logarithm of 95 is 1.9777236.

The logarithms of numbers between 100 and 1000, are greater than 2, and less than 3; thus the logarithm of 165 is 2.2174839, and of 984 is 2.9929951.

The logarithms between 1000 and 10000, must be somewhere between 3 and 4, and so on.

The logarithms in the above series are called indices, which are frequently neglected, the decimal part only being put down; thus, if it be required to find the logarithm of 248, it will be sufficient to put down .3944517, and the number being between 100 and 1000, I know the index is 2. Therefore the rule for finding the index is this:

"The index is always one less than the number of figures in the whole number: or the figures in the whole number must be always one more than the index."

The logarithm of

248	is	2.3944517
2480	-	3.3944517
24800	-	4.3944517
24.8	-	1.3944517
2.48	-	0.3944517
.248	-	— 1.3944517
.0248	-	— 2.3944517
.00248	-	— 3.3944517

Here the decimal figures remain the same: and the only difference is in the indices, which are increased or diminished by unit for every tenfold increase or decrease of the whole number. It will be observed, that where there is but one whole number, the index will be 0; but if the figures be decimals, as .248, the index is one minus;

or — 1; by the prefixing 0 to the decimal figure, the value is diminished in a tenfold proportion, then the index is — 2, or minus two.

We cannot pursue the subject farther for want of tables, which would be incompatible with this work.

LOGIC, is the art of thinking and reasoning with judgment and propriety: or, it may be defined to be the history of the human mind: because it traces the progress of knowledge from the first and most simple conceptions, through all their various combinations, gradations, and the inferences that are drawn from a comparison of ideas.

Logic, is doubtless, one of the most important sciences that can be impressed on the young mind; inasmuch as it unfolds the nature of the faculty of reflection, while it displays the proper manner in which the mental powers are to be exercised, in the pursuit of truth and knowledge. Farther, it cautions us against those errors and mistakes to which we are liable in consequence of inattention; while it teaches us to discriminate between *real* and apparent truth; being thus admirably calculated for the investigation of interesting subjects, both of literature and morality; as it enables parties to detect the fallacy of argument.

LOG-WOOD, in the arts, is derived from a low prickly tree, which is found in great plenty at Campeachy, in the bay of Honduras, and is denominated "hæmatoxylon campechianum." It comes to Europe in large logs, cleared from the bark, and is very hard, compact, heavy, and of a red colour. It is in high request among dyers, especially in dyeing black. It gives out the colour both to water and alcohol; the liquor at first assumes a fine red colour with a shade of purple. The infusion becomes gradually deeper, and at last almost black. To cloth, previously boiled in alum and tartar, it gives a beautiful violet colour, which, however, will not stand. Alkalies render the colour darker, acids change it to yellow. From a variety of experiments it is found that the colouring matter of log-wood bears, in many respects, a strong analogy to tannin, but in others it differs from it.

LONGEVITY has ever been a desirable object among the rational part of mankind; though the licentious epicure appears to measure the duration of his life by the *good things* he has enjoyed, rather than by the number of years he has lived.

Longevity depends on a variety of circumstances, which, since the introduction of manifold luxuries, rarely unite in the same person: the principal of these is an *hereditary disposition*, which might be more regularly transmitted to children, if the frequent abuse of solid and liquid aliment, especially the custom of giving them fermented and spirituous liquors, together with the indulgence in the fashionable enervating passions, were not alike conspicuous in the present state of society, among youth and adults.

Other requisites to longevity are, a perfect birth or formation of the infant, supported by proper and rational treatment; a gradual cultivation of the mind; a constitution uncontaminated by hereditary disease; and a tranquillity that is not easily disturbed by external objects. Where these conditions prevail, and strict temperance is observed, there is a prospect of attaining to a mature old age:—from the contrary causes, or conduct of individuals, the alarming increase of deaths in large towns, may be easily explained; and especially if it be contrasted with the more simple, though gross, habits of a country life. See LIFE and DEATH.

Instances of longevity are not so rare in modern times as is usually imagined, the subjoined list, collected from various sources, is a curious proof. That we may not swell it to an inconvenient length, none are inserted who have not attained their 130th year, or whose longevity has not appeared to be well attested. Many more might, without doubt, be added, by those who have opportunities for collecting such accounts. The date affixed to each name is the year in which each person died, when that has been ascertained, or when not, the last year in which each is known to have lived.

YEAR.		AGE.
1795	D. Cameron	130
1766	J de la Somel	130
1766	George King	130
1767	John Taylor	130
1774	Wm. Bealle	130
1778	John Warson	130
1780	R. Macbride	130
1780	William Ellis	130
1764	Eliz. Taylor	132
1775	Peter Garden	131
1761	E. Merchant	133
1772	Mrs. Keith	134
1767	Francis Agne	134
1777	John Brookey	134
1744	Jane Harrison	135
1759	James Sheile	136

YEAR.		AGE.
1768	C. Noon	135
1771	Marg. Foster	136
1776	John Moriat	136
1772	J. Richardson	137
1793	— Robertson	137
1757	Wm. Sharpley	138
1768	J. M'Donough	138
1770	— Fairbrother	138
1772	Mrs. Clunn	138
1766	Thos. Dobson	139
1785	M. Cameron	139
1752	Wm. Laland	140
	C. Desmond	140
1770	James Sands	140
1773	S. Monk	142
	C. M'Findlay	143
1757	J. Effingham	144
1782	E. Williams	145
1766	T. Winsloe	146
1772	J. C. Drahstenberg	146
1652	Wm. Mead	148
1768	F. Cousir	150
1542	T. Newman	152
1635	Thomas Parr	152
1556	James Bowles	152
	Henry West	152
1648	Thos. Damme	154
1762	Polish peasant	157
1797	J. Surrington	160
1668	W. Edwards	168
1670	Henry Jenkins	169
1782	Louisa Truxo	175

A mulatto man, who died in 1797 in Frederick-town, Maryland, was said to be 180 years old.

Thomas Carn, according to the parish register of St. Leonard, Shoreditch, died the 28th of January, 1588, aged 207.—This is an instance of longevity so far exceeding any other on record, that one is disposed to suspect some mistake, either in the register or in the extract.

Extract from an "Essay on Longevity," by Sir J. SINCLAIR; published in the *Philosophical Magazine*, July, 1802

In a work, containing a number of instances of longevity, for no less a period than 733 years: viz. from A. D. 1066 to 1799, by J. EASTON, in which there is given the name, age, place of residence, &c. of 1712 persons from all parts of the world, who had attained to a century and upwards, 170 are stated to have been natives of Scotland, and the two most remarkable in the whole list, are Kentigern, a native of Scotland, and Peter Torton, of Temiswar, in Hungary, both of whom attained the great age of 185 years. This Kentigern, also known under the name of St. Mungo, was the founder of the Bishopric of Glasgow.

According to HUFELAND, of a hundred men who are born, there die:

Under	10 years	50
Between	10 and 20	20
	20 and 30	10
	30 and 40	6
	40 and 50	5
	50 and 60	3
		94

Hence it appears that there are only six out of a hundred who stand a chance of living beyond 60 years.

Of persons who have lived above a hundred years, the industrious HALLER has collected 1113 instances, and gives the following statement of the duration of their lives.

From 110 to 120	about 62 out of 1000
120 to 130	29
130 to 140	15
140 to 150	5
152 Parr	1
169 Jenkins	1

But in a more recent publication the following table is given as the result of a more extensive collection of instances of longevity.

Of males and females who lived from 100 to 110 years, the instances (out of 1712) have been - 1310

Above	110 to 120	277
	120 to 130	84
	130 to 140	26
	140 to 150	7
	150 to 160	3
	160 to 170	2
	170 to 185	3

LONGITUDE, in geography, the distance of any given point from another, in the direction of east or west; as latitude is that distance, in the direction of north or south. Latitude is reckoned in degrees from the equator; longitude, from a meridian (one of the perpendicular lines, on maps or globes, or a line parallel to these), which is fixed upon at pleasure: thus the meridian that passes over Greenwich is the meridian of Greenwich; and it is from this point that the English reckon the distance of places.

As perpendicular lines, drawn from the opposite poles of a globe, are necessarily wider apart at its greatest circumference, than at any other point between that and those poles, it follows that the width of a degree of longitude, which is determined by those lines, increases, either in a southward or northward direction, in the ratio that it approaches the equator. When, therefore, a degree of longitude is mentioned, it is impossible to know what number of miles it contains, unless the degree of latitude be also ascertained. The following table shows how many miles answer to a degree of longitude, at every degree of latitude.

Lat.	Miles.	Lat.	Miles.	Lat.	Miles.
1	59·99	31	51·43	61	29·09
2	59·97	32	50·88	62	28·17
3	59·92	33	50·32	63	27·24
4	59·86	34	49·74	64	26·30
5	59·77	35	49·15	65	25·36
6	59·67	36	48·54	66	24·41
7	59·56	37	47·92	67	23·44
8	59·42	38	47·28	68	22·48
9	59·26	39	46·62	69	21·50
10	59·08	40	45·95	70	20·52
11	58·89	41	45·28	71	19·54
12	58·68	42	44·59	72	18·55
13	58·46	43	43·83	73	17·54
14	58·22	44	43·16	74	16·53
15	57·95	45	42·43	75	15·52
16	57·67	46	41·68	76	14·51
17	57·37	47	40·92	77	13·50
18	57·06	48	40·15	78	12·48
19	56·73	49	39·36	79	11·45
20	56·38	50	38·57	80	10·42
21	56·01	51	37·76	81	9·38
22	55·63	52	36·94	82	8·35
23	55·23	53	36·11	83	7·32
24	54·81	54	35·27	84	6·28
25	54·38	55	34·41	85	5·23
26	53·93	56	33·55	86	4·18
27	53·46	57	32·68	87	3·14
28	52·97	58	31·79	88	2·09
29	52·47	59	30·90	89	1·05
30	51·96	60	30·00	90	0·00

The use of this table will be readily understood. From it, we learn that 10° of longitude in 80° latitude, amount to a hundred and four miles, and two hundredth-parts; while 10° of longitude, in 4° of latitude, contain five hundred and ninety-eight miles, and six hundredth-parts.

Longitude, in navigation, is of so much importance to safety and expedition, that the following rewards have been offered by an act of the British parliament as an encouragement to any person who shall discover a proper method for finding it out: the author or authors of any such method, shall be entitled to the sum of 10,000*l.*, if it determines the longitude to one degree of a great circle; to 15,000*l.*, if it determines the same to two-thirds of that distance; and to 20,000*l.*, if it determines the same to one half of the same distance; and half of the reward shall be due and paid when the commissioners of the navy, or the major part of them, agree that any such method extends to the security of ships within eighty geographical miles of the shores, which are places of the greatest danger; and the other half, when a ship, by the appointment of the said commissioners, or the major part of them, shall thereby actually sail over the ocean, from Great Britain to any such port in the West Indies, as those commissioners, or the major part of them, shall choose for the experiment, without losing its longitude beyond the limits before-mentioned. The French, Dutch, Spaniards, and other nations, have likewise offered rewards for the same purpose.

In order to find the longitude with the required precision, it is necessary to construct a perfect time-piece; for, since by the motion of the earth round its axis, every point upon its surface describes the circumference of a circle, or 360°, in twenty-four hours time, it is plain it must describe 15° in one hour, because the twenty-fourth part of three hundred and sixty is fifteen.—Hence the difference of longitude may be converted into time, by allowing one hour for every fifteen degrees, and proportionally for minutes: so, also, difference of time may be converted into difference of longitude, by allowing fifteen degrees for every hour, and proportionally for a greater or less time. Consequently, the one known, the other is easily found.

Mr. JOHN HARRISON, of Great Britain, produced a time-keeper of his own construction which did not err more than a second in a month. This was in the year 1726, and he received much encouragement to go on to render his time-piece still more perfect, and in 1761 his son embarked in a voyage, for Jamaica, with a watch of his father's construction, and he found that it had erred in four months, less than two minutes in time, or about 28½ minutes of longitude, which was within the exactitude required by the act: he therefore claimed the reward of 20,000*l.* Another trial, to Barbadoes, was demanded, and on his return he received 10,000*l.*, with the promise of the remainder when he should have constructed other watches equally accurate in keeping time. The commissioners likewise agreed with Mr. KENDAL, one of the watchmakers appointed by them to receive Mr. HARRISON's discoveries, to make another watch on the same construction with this, to determine whether such watches could be made from the account which Mr. HARRISON had given, by other persons, as well as himself. The event proved the affirmative, for the watch produced by Mr. **Kendal**, in consequence of this agreement, went even better than Mr. **Harrison**'s; it was sent out with captain **Cook** in his second voyage towards the south pole and round the globe from the year 1772 to the year 1775: when the only fault found in the watch was that its rate of going was considerably accelerated, though in this trial of 3 years and a half, it never amounted to 14½″ a day. The consequence was, that the House of Commons were pleased to order the other half of the reward to be given to Mr. **Harrison**. This gentleman had also, at different times, received other sums of money, as encouragements to him to continue his endeavours, from the board of longitude; from the East India company, and from opulent individuals.

Longitude, *of a star*, an arch of the ecliptic, intercepted between the first of Aries, and the point of the ecliptic cut by the star's circle of longitude.

LONICERA, *honey-suckle*, a genus of plants of which there are 19 species. The Lonicera grata, or ever-green honey-suckle, is the most beautiful: it grows without any culture in North America: it has strong branches, covered with a purple bark, which are ornamented with lucid green leaves embracing the stalks, and continuing their verdure all the year. The flowers have a strong aromatic flavour, they first appear in June; and there is a constant succession of flowers till the frost puts an end to them.

LOOKING-GLASS, a plane glass mirror; which being rendered impervious to light, exhibits the images of such objects as are placed before it, apparently at the same distance behind.

Looking-glasses are made of plate-glass, which is cast and ground in the manner described under the article **Glass**. When the plates are polished, a fine blotting paper is spread on the table, and strewed over with levigated chalk, which is covered with a thin leaf of tin-foil. Upon the latter is poured the purest quicksilver, that ought to be distributed uniformly over the leaf, with cotton or other soft substance: over the mercury, clean paper must be placed; and upon this, at length, the glass-plate is pressed down by the right hand, while the paper is gently removed with the left. The plate is now covered with thicker paper, or cloth, and a heavy weight laid on it, so that the superfluous quicksilver may be expressed, and the tin adhere closely to the glass: when it is sufficiently dry, the weights are taken off, and the work is complete.

Looking-glasses are equally ornamental and useful in domestic life: hence they should not be exposed to accidents, or placed against damp walls, or in other moist situations, where the quicksilver loses its tenacity, and the beauty of the glass will, in a short time, be impaired. Those idle or conceited persons, who waste every day a *certain* portion of time, by examining their dress and countenance before a looking-glass, ought to bestow an equal share of attention on their moral scrutiny: thus, we trust, they will easily discover how to make a more proper and *economical* use of their leisure hours, which are literally *killed* before a mirror, that exhibits only the *surface* of things.

LOOM, a machine, by means of which several distinct threads are combined into one piece, or contexture.

Looms are of various forms, according to the different materials to be woven; and the various methods of weaving. As our limits do not permit us to detail them, and as they would be unintelligible, without the aid of engravings, we shall briefly mention Mr. **Samuel Sholl**'s improved *Silk Loom*, for which the *Society for the Encouragement of Arts*, &c. in 1790, conferred upon him a silver medal. His ingenious contrivance is peculiarly calculated for the lighter branches of silk-weaving: by its construction, it admits more light to the workmen, and may be placed in almost any low garret, without breaking the walls; the *porry* may be made of any length, by only screwing the cane-roll posts nearer or farther from the breast-roll; and it is, on the whole, more portable, and fixed with less trouble, than any loom hitherto invented. Another advantage is its cheapness; the price being one-third less than that of the common looms; beside which, the most valuable parts of the old materials may be still preserved, and adapted to the new machinery. For a more minute account of Mr. S's contrivance, the reader will consult the 8th volume of the *Transactions* of the patriotic Society above-mentioned.

LOOSE-STRIFE, the **Creeping**, or *Lysimachia nummularia*, L. an indigenous, perennial plant, growing in moist, shady meadows; and flowering in the months of June and July. This vegetable affords a wholesome food for cattle, and especially for sheep. On account of its sub-acid and mildly astringent properties, it is considered as one of the most efficacious vulnerary herbs. Bechstein asserts, that the leaves and flowers of this plant, steeped in oil, furnish an excellent remedy for destroying the worms and insects infesting the floors of granaries.

Loose-strife, the Hysop-leaved, or *Lythrum hyssopifolium*, L. an indigenous annual plant, which grows in stagnant waters, and marshy grounds: in the month of August, it produces bright purple flowers, from which a very beautiful pigment may be extracted.

Loose strife, the Purple or Purple-spiked Willow-herb, Grass-poly, *Lythrum Salicaria*, L. an indigenous perennial plant, growing in marshes, and on the banks of rivers; flowering in the months of June and July. This neglected vegetable is remarkable, as every part of it acquires a red colour, when it begins to decay. Morand observes, in the *Memoirs of the French Academy*, for 1769, that he found roots and branches of the purple loose-strife buried under ground, between the rind of which were deposited several particles of a beautiful blue colour; and that, by chemical analysis, they proved to be a true *native Prussian blue*. Suckow obtained from the flowering stalks, on the addition of green vitriol, a deep black dye; and Dambourney, on preparing the cloth in a diluted solution of bismuth, a very fine chesnut tinge. In tanning, likewise, the whole plant, while in blossom, has been employed with advantage; so that, according to Gleditsch, excellent sheep-skins were fully dressed, in the course of twelve days.

LOTION, is such washing as concerns the beautifying the skin, by cleansing it of those deformities which a distempered blood sometimes throws upon it. There is reason to apprehend that almost all the lotions advertised for sale, as quack medicines, contain much poisonous matter, such as muriated mercury, and therefore ought never to be had recourse to.

LOTTERY, a kind of public game at hazard, which, in England, is managed by commissioners appointed by government. It consists of a certain number of tickets, that are drawn out of two different wheels, one of which contains a limited proportion of blanks and prizes; and the other, the corresponding tickets.

Lotteries were originally instituted with a view to raise money for the service of the State; but this method appears to have been contrived by persons who possessed no practical knowledge of mankind; as it encourages a spirit of gambling, that cannot be too severely censured. One of the most cogent arguments to discourage this practice, appears to be the disproportion between the *distant* gain, and the *probable* loss of the numerous adventurers: nay, it is an indisputable fact, that if a *club* of infatuated persons (indeed, there are too many of this description) were to purchase the tickets of the whole lottery, they would necessarily lose about *fifty per cent.* of their money; and in a similar situation is the single shareholder, who, besides, incurs the risk of losing the whole.

It is to be regretted, that the consequences of this evil are not confined to the more opulent class of society, but extend even to those industrious members, whose utmost exertions are frequently inadequate to furnish their families with *bread*. Yet such is their infatuation, that nearly the whole of their weekly earnings is squandered on *insurances*: and it is a melancholy proof of the folly of mankind, that of the bread usually consumed, *one-third* only is eaten during the eventful period of drawing the lottery. Hence we think it our duty to state abuses of such magnitude; as they prey on the vitals of the community: and we trust that the wisdom of the legislature will shortly be induced to reform, or, if possible, to abolish the whole department of the lottery, and to adopt a less hazardous, and more dignified plan of finance.

LOVAGE, or *Ligusticum*, L. a genus of plants, consisting of thirteen species, two of which are natives of Great Britain. The principal of these, is the *Scoticum*, Scottish Lovage, or Sea-parsley, growing on rocks and cliffs near the sea-coast in Scotland, and the Western-Islands: flowering in the month of July. It is relished by horses, sheep, and goats, but refused by cows. This species is greatly valued in the Isle of Sky, where it is eaten either as salad, or boiled as greens: its roots are reputed to be excellent carminatives, and an infusion of the leaves affords a good physic for calves.

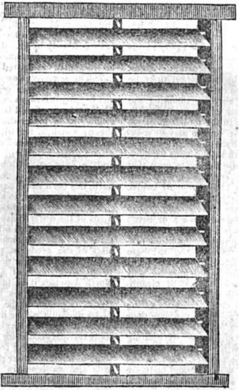
LOVE-APPLE, or *Solanum Lycopersicum*, L. a native of the East and West Indies, whence it has been introduced into our gardens.

The love-apple is greatly esteemed at table: it is either used in soups or broths, to which it imparts an agreeabe

taste; or it is boiled and served up as a *garnish* to dishes of animal food.

The cultivation of this excellent vegetable is rapidly extending in Pennsylvania, where, a few years ago, it was scarcely known. The apples stewed make an excellent sauce for fish; and a fine catsup, which is used by the French in a variety of dishes.

LOUFFER, an upright post having a number of projecting pieces of wood, of small diameter, for the purpose of lifting the slats of windows, of workshops, barns, and stables. The number of projecting pieces are proportioned to the number of slats; the post is placed on the top and lower part of the window frame, and turns upon pivots above and below. The slats likewise turn on their centre; and when it is required to lift them, a person takes hold of the handle which is fixed about the centre of the post and turns it round, the projecting pieces then pass under the slats and elevate them. The annexed cut will give a good idea of this contrivance, which, though common in curriers' shops, and breweries, is introduced with a view of recommending them to farmers for barns and granaries.



LOUSE, in zoölogy, a genus of insects too well known to require any description.

Lice are not peculiar to mankind, but infest quadrupeds, birds, fishes, and vegetables. Each class of animals is troubled with a particular species of those vermin; and birds are remarkably obnoxious to their attacks. There are forty different species of lice that prey on the fluids of living animal bodies, and which are distinguished by their colour, shape, and size; nay, even insects, such as snails, spiders, and bees, are not exempt from them.

The human race is liable to be exclusively invaded by three different species of lice, namely, 1. The Crab or Body-louse, which never appears in clothes, or on the head, but harbours only in some parts of the bodies of uncleanly, or such persons as are disordered by dissipation: it is easily exterminated, by applying a strong decoction of tobacco, or mercurial ointment. 2. The Clothes-louse is larger than the next species, and has a thick head; it visits the skin only for imbibing the necessary portion of its nourishment, when it retreats to the folds and seams of clothes: these vermin may be speedily destroyed by fumigating the articles of dress with sulphureous vapours. 3. The Head-louse frequents only that part of the body, and is so prolific, that each female, in the course of twelve days, deposits several hundred eggs, or *nits*, which are closely cemented to the hair, and hatched in six or seven days, by warmth and perspiration: after 3 weeks, the young brood is fit for propagating their species; and as there are, perhaps, a hundred females to one male insect, their rapid increase may be easily conceived. Want of cleanliness; immoderate warmth; violent perspiration; and a corrupted state of the human fluids, remarkably promote their generation. Among the most simple and harmless remedies for extirpating these vermin, is the seed of parsley reduced to a fine powder. But, if the humours of the whole animal body are in so vitiated a state, that the blood is contaminated by sensual excess of every kind, there arises the *morbus pedicularis*, or the most dreadful of all diseases, in which those disgusting insects are bred in ulcers, and cover the whole frame, so that the ill-fated victim cannot be relieved.

Some constitutions, however, are more exposed to these odious vermin than others; and it is remarkable, that sea-faring men, performing voyages to the East Indies, though infested with them on leaving Europe, lose them in a certain degree of latitude during their voyage; but, on their return, are again liable to their incursions.

[A decoction of tobacco—or a tincture of camphor—or larkspur seed infused in whiskey, will kill lice on the head.—T. C.]

LOUSE-BERRY. See SPINDLE-TREE.

LOUSE-WORT, or *Pedicularis*, L. a genus of native perennial plants, comprising two species, viz.

1. The *palustris*, or MARSH LOUSE-WORT, which grows in marshes, ditches, on moist meadows, and in pastures; where it flowers in the months of June and July. This vegetable is eaten by goats, though not relished by hogs; and refused by horses, sheep, and cows; in the latter of which, if accidentally swallowed among other grasses, it occasions bloody urine. Hence this dangerous and troublesome weed ought to be diligently eradicated.

2. The *sylvatica*, COMMON or PASTURE LOUSE-WORT, thrives on wet pastures, and heaths; it flowers in June and July. This plant is refused both by cows and swine: it is particularly noxious to sheep; which, if fed with it, will, in a short time be covered with scabs and scurf; their wool will become loose, and be over-run with vermin: the expressed juice, or a decoction of this herb, has been advantageously applied, by way of injection, to sinuous ulcers.

LOXIA, the grosbeak, a genus of birds of the order Passeres. The Loxia curvirostra, or cross-bill, is about the size of a lark. Its favourite food consists of the seeds of pine; and pine woods are always its principal haunts. It has the manners of a parrot, and in North America it builds on the highest firs, and attaches its nest to the trunk by means of the exuded resin. Loxia pyrrhula, or the bulfinch, is commonly known in England, changing its residence according to the season, in summer retreating from the habitations of man, in winter preferring orchards and gardens, in which it does great mischief by destroying the buds of trees. These birds may be instructed to whistle a variety of tunes. The Loxia chloris, or greenfinch, is a species of this genus.

LOZENGE, a form of various medicines moulded into small, flat cakes, to be held or chewed in the mouth, till they are dissolved.

As lozenges are of considerable utility for various purposes, we shall give a few instructions for preparing them, together with some simple recipes.— First, particular care ought to be taken that no decayed or impure matter be admitted into the powder; the dry aromatics should be moistened with a little water during the pulverisation; and those which possess a greater degree of humidity, ought to be gradually dried in a gentle heat, before they are committed to the mortar. If the mass prove so viscid as to adhere to the fingers in mixing the ingredients, the hands may be rubbed with any sweet oil; or some pulverised liquorice, starch, or flour, may be sprinkled over them during the process. As soon as the lozenges are formed, they must be placed on an inverted sieve, in a shady but airy situation, where they should be frequently turned, in order that they may be perfectly dried; and, when all moisture is exhaled, they should be preserved in glass, or in well glazed earthen vessels, secure from the influence of damp air.

Liquorice Lozenges: Let four ounces of the extract of liquorice, (Spanish juice); a similar quantity of gum-arabic, and eight ounces of double-refined sugar, be dissolved in warm water, and strained; after which the ingredients are to be evaporated to a proper consistence. This preparation is an agreeable pectoral, and may be used at pleasure: it is well calculated to allay that tickling sensation in the throat, which excites coughing.

White Pectoral Lozenges—consist of one pound of double-refined sugar, four ounces of gum-arabic, and one ounce of starch: these ingredients should be finely pulverised, and formed into a mass of a due consistence for lozenges, which in their effects are similar to those of the preceding composition.

Liquorice Lozenges with Opium: Take two drachms of pure opium, and half an ounce of tincture of Tolu: let the opium be ground with the tincture till it be perfectly dissolved, when eight ounces of common syrup, and five ounces of extract of liquorice previously softened in warm water, are to be gradually added. While these ingredients are triturating, five ounces of pulverised gum-arabic are, by degrees, to be sprinkled in the mixture; and, as soon as the whole is incorporated, it may be formed into lozenges, each of which should weigh ten grains. These are very serviceable for troublesome coughs that depend on an irritation of the fauces, which they remarkably tend to relieve; but should not be used too freely, as the large proportion of opium they contain, cannot fail to render the body costive.

Lozenges of Magnesia: Let four ounces of magnesia, two ounces of double-refined sugar, and one scruple of pulverised ginger, be incorporated with the mucilage of gum-arabic, and worked into a proper form. This preparation is eminently useful to those who are troubled with the heart-burn; especially if that complaint depend on acidity generated in the stomach.

LUCANUS, a genus of insects of the order coleoptera, of which there are 26 species. The principal is the Lucanus cervus, or stag-chaffer, which is the largest of European coleopterous insects, being two or three inches long. It is chiefly found in the neighbourhood of oak-trees, and its larvæ are found in the hollows of those trees, residing in the fine mould usually seen in such cavities, and feeding on the softer parts of the decayed wood. The larva, when arrived at its full size, which is about its fifth or sixth year, forms a hollow in the earth in which it lies, and afterwards remaining perfectly still for the space of a month divests itself of its skin and commences pupa. It lies in this state three or four months, and then gives birth to the perfect insect. The exotic species of this genus are mostly natives of America, but one species has been discovered in New Holland, which differs from the rest in being entirely of a beautiful golden-green colour, with jaws of a brilliant copper colour.

LUCERNE, or *Medicago sativa*, L. a valuable exotic plant, which sometimes grows naturally in meadows, pastures, and on ditch-banks; flowers in the months of June and July. It was introduced from France into Britain, about the middle of the seventeenth century.

Lucerne thrives best in deep, rich, friable loams, whether they abound in sand or gravel; as well as in all good dry soils, and in the coldest climate. As the luxuriance of its crops depends entirely on keeping the soil clear from weeds, this circumstance ought to be particularly attended to, while the plant is young. The land ought, therefore, to be previously cleaned; for which purpose Mr. YOUNG recommends two successive crops of turnips or of carrots, as the most successful mode of preparing it; but, if a fallow be found more convenient, a man should follow the ploughs or harrows while working; collect all roots, weeds, &c. and clear away such as have taken too deep root, to be eradicated by those implements. The soil must be ploughed and harrowed three times in the second spring, previously to the sowing, in order that it may be perfectly pulverised. There is no absolute necessity for manure; though, when laid on, it should be spread with the first crop of carrots or turnips.

The land being thus prepared, lucerne may be propagated either by sowing it broad-cast; by drilling; or by transplanting it; all of which methods have been attended with such success, as to render it difficult to decide which is the most advantageous. The proper season for sowing, is towards the end of March, or in the month of April: if broad-cast, 20 lbs. of seed will be required for one acre; if drilled, 6 lbs. will suffice, provided the seed be set in equi-distant rows of two feet; and, if the lucerne be sown with corn, the value of the crop will be considerably increased. The best grain for this purpose, in Mr. YOUNG's opinion, is *oats;* six pecks of which should be sown on an acre of very rich land; but if the soil be indifferent, two bushels are requisite; and, if it be *poor*, three bushels are to be allowed to each acre. As soon as the oats are sown and harrowed, the lucerne should be deposited in the ground, and a light harrow passed over; a similar method ought to be adopted if the seed be drilled; but, if sown in a nursery, with a view to transplantation, it should not be mixed with any corn, but committed to the ground early in the spring; after which the young plants ought to be carefully *hand-hoed*, to facilitate their growth till the month of August, when they will have attained sufficient size to be removed to the field. This operation is performed by taking up the plants with a sharp spade, during moist weather; then cutting off the tap-roots, eight, nine, or ten inches beneath the crown of the plant; though the lateral fibres must be somewhat shortened, and the stalks clipped off about five inches above the crown. After these operations by the knife, the plants are to be thrown into a vessel of water, and placed in the shade, that they may retain their freshness. Holes are next to be made with a dibble, and filled with water, in which the roots are set at the distance of 40 inches from each other, the stalks being earthed up to the height of two inches. Should a dry season succeed, it will be requisite to water the plants liberally; as they will thus not only be invigorated, but the soil will be settled around their roots. The intermediate spaces ought to be carefully cleared from weeds after every cutting: and when the plant arrives at perfection, it will admit of being mowed five and even six times in one season.

Lucerne is of great value, and fully merits the commendations bestowed upon its culture. On rich and well-tilled soils, its growth is so rapid, that it rises to the height of *eighteen* inches within *thirty* or *forty* days; and its produce on poor land is fully adequate to maintain three horses per acre: though, if the ground be well managed, it will readily support from three to six horses. The expense of raising this plant is very considerable: Mr. HARTE, in his *Essays on Husbandry*, estimates it, when transplanted, at *6l. 12s.* per acre for the first year: and the cost of the second, as well as each subsequent year, during the continuance of the plant (which may be fixed upon an average at ten years,) will amount to about *2l.* per acre.

The first use of this beneficial plant is that of *soiling* horses in the stable: for this purpose it is peculiarly advantageous; few other articles of food agreeing so well with those animals. It is likewise eminently adapted to the soiling of working oxen, cows, young cattle, and even hogs, in a farm yard. In short, Mr YOUNG conceives lucerne to be well calculated for fattening oxen, though it has never been tried with such design. Farther, as hogs do not bite so closely as sheep, he supposes that the former might eat it with safety, and that a small field, planted with it, near the farm yard, "would be of admirable use and profit."

Beside these various purposes to which lucerne is subservient, it ameliorates the soil so that considerable crops of corn have been obtained after it; nay, instances have occurred, in which a complete ploughing, that was given with a view to eradicate it for corn, has renovated this plant to such a degree, that it was left again for another series of years. Those of our agricultural readers, who wish to acquire more minute information relative to the management of lucerne, will consult Mr. HARTE's classical work above mentioned, and also Mr. ROCQUE's *Practical Treatise on cultivating Lucerne Grass*, in which this interesting subject is fully discussed, while its advantages and expenses are fairly appreciated.

Under the article grass, some observations were given upon the culture of lucern, in this country, which being the result of experience, deserve attention. A friend informed Dr. MEASE, that he tried it many years since, near Charleston, S. C. in drills, and that it succeeded admirably. The long continued heat enabled him to cut it five times in one season. Dr. MUHLENBERG of Lancaster cultivates it, and "sows it alone, after potatoes or Indian corn, or in preference after cabbage crops, about the 2d of May; he cuts and feeds it green," and speaks highly of it.

Lucern certainly is well calculated for the hot summers of the United States; its long tap root seeking nourishment from a great depth, enables it to withstand the desructive droughts, which so frequently occur. Dr. MEASE saw it in July, 1803, near Philadelphia, in a field with clover, green and fresh while the clover was nearly destroyed, no rain having fallen for some weeks.

The seed should be fresh, and if sent for to France, (whence the British seedsmen obtain it) care should be taken to procure that of the last season.

LUMBAGO. See RHEUMATISM.

LUNACY. See MADNESS.

LUNGS, in anatomy, denote the two viscera or lobes in the cavity of the breast, by which we breathe. They are connected with the neck, and situated on the right and left side of the heart. Being furnished with innumerable cells, which are formed by the descent of the wind-pipe into the lungs, those bronchial tubes communicate with each other; and the whole appears not unlike a honey-comb.

The most important use of the lungs is that of *respiration*, by which the circulation of the blood is supposed to be effected; and by the consequent alternate pressure of the different parts of the lower belly, the digestion of food is promoted. Besides, not only the expulsion of the fœces and urine greatly depends on the constant action of the lungs, but likewise the sense of smelling is enjoyed by inhaling the air; and it is chiefly by the organic structure of these vessels, that mankind are enabled to speak. Lastly, they perform the office of excretion, and expel those useless matters which, if retained in the system, would be productive of fatal consequences.

The organs of breathing are subject to various affections, such as ASTHMA, CATARRH, COUGH, &c. which are discussed in their alphabetical series. Hence, we shall at present treat only of the *Peripneumonia*, or INFLAMMATION OF THE LUNGS. This dangerous affection manifests itself by a moist cough, in which the expectorated matter is frequently streaked with blood; by an obtuse, dull pain under the breast-bone, or between the shoulders; anxiety and difficulty of breathing; the face is swelled, and appears of a purplish hue. It chiefly attacks persons of gross habits, who eat strong food, and drink viscid liquors: it is generally fatal to the asthmatic, especially if they be of an advanced age.

Causes. An inflammation of the lungs is not always a primary disorder, but more frequently is the consequence of a quinsey, pleurisy, catarrh, and other diseases. It also arises from an obstructed perspiration produced by cold; from the wearing of wet clothes; from too violent exercise; fractures or other injuries of the ribs; suppression of the itch, rose, and other cutaneous eruptions; as well as from the exhalation of noxious or sulphureous particles; and lastly from worms.

The peripneumony is divided into the *spurious*, which is occasioned by pituitous or viscid matter obstructing the lungs; and the *catarrhal*, which may originate from any of the causes already specified, but more especially from a defluxion of thin acrid matter on these organs. The treatment of both, however, being similar, we shall briefly state the chief points relative to this subject.

Without exception, the most efficacious remedy in pulmonary inflammation is blood-letting, which may be performed in either arm; and the quantity of blood to be taken away must be in proportion to the patient's strength. Next to bleeding, the antiphlogistic or cooling regimen should be strictly adhered to; the patient not be indulged in feather-beds, or warm couches, so long as he can support himself; and warm diluent drinks, impregnated with vegetable and nitrous acids, should be given in copious draughts.

Poultices and fomentations have also been applied to the painful side with considerable success; but the repeated use of blisters has been found more effectual.

Among the various remedies proposed with the view of affording relief in the commencement of this formidable disease, few have been more efficacious than the steam of warm water impregnated with vinegar, and copiously inhaled. One of the most powerful expectorants, however, appears to be the tartarised antimony, given in very small or nauseating doses. And, as inflammations of this nature frequently terminate in what are called *critical* and spontaneous sweats, these ought to be cautiously promoted, but without the aid of stimulant medicines. Lastly, the diet cannot be too slender; it should, indeed, consist chiefly of weak broths, slightly acidulated with the juice of oranges or of lemons; and the patient's drink ought to be thin water-gruel, sweetened with honey, or a decoction of liquorice, the roots of fennel, and the like, in which a small portion of currant or similar jelly, may be dissolved.

Inflammation of the Lungs, in *Farriery*, a disorder to which horses are occasionally subject. It is indicated by the animal's restlessness, as he never lies down during the prevalence of this malady: his fever is violent, and he breathes with difficulty. The mouth is generally open, whence a kind of ropy slime flows copiously, while a viscid reddish or yellowish water runs from his nose, and likewise adheres to the inside of his nostrils.

The first remedy in this complaint is bleeding: three English quarts of blood should be taken from the animal, on the first day; and four pints, on the succeeding morning. If the unfavourable symptoms do not abate, it will be necessary to draw blood repeatedly, one quart at a time; but, if the creature be old or weak, the bleedings ought to be sparing in quantity, and more frequently repeated. Next, some sweet hay and bran should be cut very small, scalded together, and placed in the manger, in order that the fumes may be inhaled. Mr. Taplin directs this *internal fomentation* to be attended to every fourth or fifth hour, and the following decoction to be immediately administered. Let six ounces of pearl-barley, a similar quantity of split raisins and Turkey figs cut in slices, and two ounces of bruised stick liquorice, be boiled in a gallon of water, till the liquid be reduced to three quarts. It is then to be strained, and a pound of honey added, while it is hot; and, as soon as it is cold, a pint of distilled vinegar. Of this decoction he prescribes one pint to be given, with the addition of an ounce of nitre, every fourth, fifth, or sixth hour, according to the greater or less urgency of the symptoms.

Should the disease progressively become more obstinate, and the animal be costive, a clyster ought to be given; consisting of two quarts of common gruel, six ounces of coarse sugar, four ounces of Glauber's salt, two ounces of tincture of jalap, and a quarter of a pint of olive-oil. The injection is to be repeated once in twenty-four hours, or oftener, if necessary. But, if the virulence of the disorder abate in consequence of these applications, the subsequent treatment may be similar to that stated in p. 553 of volume first: beside which, one of the following balls may be administered every morning, for a fortnight:—Take Castile soap, six ounces; gum ammoniac, two ounces; anise seeds and cummin seeds, of each four ounces, in powder. These ingredients are to be incorporated with a sufficient quantity of honey to form a mass, which should be divided into twelve balls. The horse's diet, during the progress of the disease, ought to consist of warm mashes of scalded bran, sweetened with four ounces of honey; while his common drink may be thin gruel, in each draught of which two ounces of cream of tartar should be dissolved. These preparations, however, may be gradually relinquished, as the animal recovers; and the mode of treatment be varied as circumstances may require.

LUNGWORT, or *Pulmonaria*, L. a genus of perennial plants, comprising six species, three of which are natives of Britain: the principal of these is the *officinalis*, Common Lungwort, Spotted Lungwort, Cowslips of Jerusalem, or Broad-leaved Lungwort; growing in woods, and flowering in the months of April and May. This species is eaten by sheep and goats, but is not relished by cows, and totally refused by horses and hogs. It is cultivated in gardens, on account of its leaves, which, in a fresh state, possess a slightly astringent and mucilaginous taste. They are recommended in tickling coughs, pulmonary consumption, &c. but are more useful as a culinary vegetable, and as salad, especially in early spring.

When burnt, the common lungwort affords a larger proportion of ashes than almost any other plant; the produce, in general, amounting to one-seventh part of its weight.

LUPINE, or *Lupinus*, L. a genus of exotic plants comprising nine species, most of which are cultivated in gardens, on account of their beautiful flowers: they are raised from seed, which may be sown in any open borders, where they thrive, and present a pleasing variety.

The seeds of the WHITE LUPINE (*Lupinus albus*) have a leguminous, though disagreeably bitter taste, and are said to be vermifuge; both when taken internally, and applied externally. Some authors, however, suppose them to be of a poisonous nature; yet such seeds were much used by the Greeks as an article of food, and have been recommended by GALEN, as affording wholesome aliment. In the *Transaction of the Patriotic Society of Milan*, vol. ii. there is an account of the manner in which this plant may be converted into *cordage* or ropes, and likewise into *paper*. BECHSTEIN says, that its flowers furnish the bees with abundance of honey.

LUSTRE, in mineralogy, is a term used in works of modern chemistry. The lustre of minerals is of five kinds. 1. Splendent, that is, when in full day-light, the lustre can be seen at a great distance. 2. Shining, when at a distance the reflected light is weak: 3 Glistening, when the lustre is only observable at no greater distance than an arm's length. 4. Glimmering, when the surface held near the eye in full day-light presents a number of shining points. 5. Dull, when the surface has no lustre.

LUTE, a musical instrument, consists of four parts, viz. the table; the body or belly, which has nine strings; the neck, which has nine or ten stops or divisions, marked with strings, and the head or cross, where the screw for raising and lowering the strings to a proper pitch of tone are fixed. In the middle of the table there is a passage for the sound; there is also a bridge that the strings are fastened to, and a piece of ivory between the head and neck, to which the extremities of the strings are fitted. In playing, the strings are struck with the right hand, and with the left the stops are pressed.

LUTE, a composition of certain viscid or tenacious matters, which becomes solid, when dry; and which, on being applied to the junctures of vessels, closes them so effectually as to prevent the admission or egress of air.

Though lute is chiefly used by chemists, it also comprehends any species of cement, applied to vessels, or furnaces, which are exposed to an ardent heat. It is variously prepared of rye-flour and water; quick-lime and the whites of eggs; iron filings, brick-dust, and linseed-oil; potters' earth river-sand, horse-dung, pulverised glass, or flocks of wool mixed with salt-water or bullock's blood. The best lute, however, and which is most easily procured in London, is *Windsor-loam*: it should be moderately stiff, so that, when moistened with water, it may be pressed into the side, or crevices, of the furnace, &c. As soon as the clay begins to dry, it must be beaten closely down to the sides, and the fissures repeatedly filled up, till the whole be perfectly closed.

The late Dr BLACK recommended a simple mixture of sand and clay, as preferable to any other composition. The proportions for resisting the violence of fire are, four parts of sand to one of clay; but, if the lute be intended for lining or coating furnaces, he directs six parts of sand to be taken to one of clay, in order that the contraction of the latter may be effectually prevented. This compound is to be applied in a manner similar to that above stated, but it must be allowed to dry for a considerable time; after which a fire may be kindled, and the furnace gradually heated for one or two days. The heat should then be raised to the highest degree of intensity, by which the lutting will acquire the hardness of free-stone, and afterwards be as durable as any other part of the furnace. (See CEMENT.)

LUTRA, the otter, a genus of mammalia, of the order Feræ, of which there are eight species. The Lutra vulgaries, or common otter, lives chiefly on fish, and may be trained to catch fish for its owner. One kept by Mr. JAMES CAMPBELL would catch ten salmon in a day. Otters, in their wild state, have a propensity for destruction, killing many more fish than they eat. The Lutra Marina, or sea-otter, is very valuable for its skin, a single fur has been sold among the Russians for twenty-five pounds. Sea-otters are perfectly inoffensive, and the female manifests the most affectionate attachment to her young. These animals feed on crabs, lobsters, and other shell-fish. The flesh of the young is reckoned like that of lamb, and is highly valued.

LUXATION, signifies the dislocation of any bone out of its natural articulation, so as to impede or destroy its proper motion. The general symptoms of this complaint are, inability to move the injured limb; pain; tension; and deformity of the part affected: it is also frequently attended with inflammation and fever. [Apply to a surgeon. —T. C.]

LYTTA, or SPANISH FLY, (*Lytta vesicatoria*) is a coleopterous insect about an inch in length, of shining blue-green colour with black antennæ.

It is found in most parts of Europe, and feeds on the leaves of ash, poplar, elder, lilac and other trees.

These insects, which are known in medicine by the name of *cantharides*, are of incalculable importance to mankind as the basis of blistering plasters, and also as an internal remedy against many diseases. They are imported, in a dried state, from Spain, Italy, and the South of France; in many parts of which countries, about the middle of summer, they are found in vast abundance. As they are generally in a torpid state during the day, they are easily collected by shaking them from the trees upon a cloth spread on the ground to receive them. When a sufficient number has been collected they are tied in bags, and killed by being held over the fumes of hot vinegar. After this they are dried in the sun, and packed in boxes for sale. The odour which is emitted by these insects is peculiarly nauseous, and so powerful, that great injury has sometimes been experienced by persons employed in picking them, and by those who have even fallen asleep under the trees where they abound.

Previously to being used they are pounded; and if in this state they are applied to the skin, they first cause inflammation, and afterwards raise a blister. The usual blistering plaster is formed with Venice turpentine, yellow wax, Spanish flies, and powdered mustard.

M.

M, the thirteenth letter, and tenth consonant of the English alphabet, is a liquid and labial consonant, pronounced by striking the under lip against the upper one. M. as a numeral stands for mille, a thousand; and with a dash over it thus $\overline{\text{M}}$, 1,000,000. M. A. magister artium: M. D. medicinæ doctor: MS. manuscript, and MSS. manuscripts. In the prescriptions of physicians M. stands for manipulus, a handful.

MACARONI. Take the white of an egg, and flour enough to make a stiff paste; roll it out thin, and cut it like macaroni; boil it in milk and water a quarter of an hour, stew it with a teacupful of rich cream, and a teacupful of rich, old, scraped cheese; stew it till the cheese is melted; cover it with new cheese scraped, that will toast; brown it.

MACE, the inner coat of the Nutmeg, is a thin unctuous membrane, of a yellowish colour, which it acquires by being dried in the sun. It is imported from India in flakes, about an inch in length, which present a variety of ramifications.

MACHINE, in general, whatever hath force sufficient to raise or stop the motion of a heavy body. Machines are either simple or compound; the simple are the six mechanical powers, viz. the lever, pulley, wheel and axis, inclined plane, wedge, and screw. See Mechanics.

Mace emits a very fragrant, agreeable odour, and has a pleasant, though acrid and oleaginous taste. It is reputed to be an excellent carminative, and stomachic, possessing all the virtues of the nutmeg, but with less astringency. Its oil, whether distilled or expressed, is equally efficacious; and, when taken internally in doses of from one to five drops, frequently affords relief in colics. It promotes digestion, and often prevents vomiting and hiccoughs, on being applied to the region of the stomach. A decoction of mace and cloves, relieves the sickness of pregnancy. See more under Nutmeg.

MACKREL (*Scomber scomber*) is known from other fish by having five small and distinct fins betwixt the dorsal fin and the tail.

Its usual length is from a foot to eighteen inches, and its weight seldom exceeds two or three pounds.

The mackrel fishery is an object of great commercial importance to the inhabitants of most of the countries on the shores of which these fish abound. During the summer season they approach our coasts in immense shoals, and are generally caught in what are called seine nets. From June to August many of our markets are supplied with them, but as they become putrid sooner than most other fish, they cannot be carried to any great distance, nor be kept for any great length of time. On this account it is that they are allowed to be sold in the streets of London on Sundays, and in catholic countries on Sundays and festivals.

When quite fresh mackrel are an excellent fish for the table, and are in best season from May to July. Both in Italy and England they are often pickled with vinegar and spices, and sometimes with bay leaves intermixed. By the inhabitants of many parts of the north of Europe they are salted; and in this state constitute a cheap and very important article of subsistence. In Scotland they are frequently cured in the same manner as herrings. It was with these fish chiefly that the ancient Romans formed their celebrated pickle called *garum*. This in the ancient world constituted a very considerable branch of commerce, not only from its being used as an highly esteemed sauce, but also as it was considered a remedy for various diseases. In the Mediterranean the *roes* of mackrel are salted, and used for *caviar*.

MACROPUS, the kangaroo, is a genus of mammalia of the order feræ. This is one of the most curious animals discovered on the continent of New South Wales, where it was first observed in 1770 by captain Cook's sailors. Its general position, when resting, is that of standing on its hind feet, on their whole extent, to the knees, and its fore feet are frequently employed like those of the squirrel, as hands. In its rapid motion, the fore feet are wholly useless, and it proceeds by leaping on its hind feet, which it will do to the distance of 15 or 16 feet, and with bounds so rapid in succession, that it exceeds in swiftness the common dog.

MACULÆ, dark spots appearing on the luminous faces of the sun, moon, and even some of the planets. They were first discovered by Galileo, soon after he had invented his telescope. It has been supposed that these spots adhere to, or float upon the surface of the sun, because, 1. Many of them are observed to break near the middle of the sun's disc, others to decay and vanish there, or at some distance from his limb. 2. Their apparent velocities are always greatest over the middle of the disc, and gradually slower from thence on each side towards the limb. 3. The shape of the spots varies according to their position on the several parts of the disc; those which are round and broad in the middle grow oblong and slender as they approach the limb, as they ought by the rules of optics. By means of these spots the diurnal revolutions of the sun and planets have been discovered. See Solar *system*, and Sun.

Mad-dog. See Bite of a Mad-Dog, and Hydrophobia.

MADDER, or *Rubia*, L. a genus of plants, comprising nine species, one of which is a native of Britain, viz. the *R. tinctorum*, Wild, or common Dyers'-Madder. It is perennial, and flowers in the months of June and July.

The most proper soil for the cultivation of Madder, in England, is a soft sandy loam, that has been in a state of tillage for several years, and which is at least 2½ or 3 feet deep, being perfectly clear from all weeds. It is necessary to plough the land thoroughly, before the commencement of winter, during which it should be laid in ridges in order to *mellow;* and early in the ensuing spring, this valuable plant is propagated from slips, carefully taken from the old root: these slips ought, according to the late celebrated Miller, to be set by the dibble, in rows at the distance of two or three feet from each other; though, in the opinion of Bechstein, they should be planted only six inches asunder. And, as madder requires constant moisture, without which the young roots would shrivel and decay, it will be useful, before they are committed to the ground, to immerse them in a fluid paste made of the best garden mould and soft water. Besides, this transplantation should be undertaken only in rainy weather, or when there is reason to suppose that showers will speedily follow.

During the first summer, it will be sufficient to *scuffle* the plants with the *Dutch hoe*, as soon as the weeds appear: in the succeeding autumn, when the stalks or *haulm* begin to decay, they must be raked off the ground, and the intermediate spaces carefully dug with a spade or turned up with a hoe-plough, the soil being laid over the roots or heads of the plants in a roundish ridge. In the ensuing summer, the same management must be repeated; but, before the ground between the plants is hoed, the haulm must be laid over the next intermediate space for two or three weeks, at the expiration of which it should be turned back again on those intervals which have been hoed; care being taken to *scuffle* the soil, so that all weeds may be eradicated. In the following autumn, the haulm must be cleared, and the mould thrown up in ridges, similar to those of the first year.

Early in the third spring, before the young sprouts appear, the ground should be well raked; and, as soon as they are ready to be removed, they must be carefully taken off, at a distance from the crown of the parent plant. The culture of madder, during this summer, varies little from that of the two preceding, the plant only being earthed up somewhat higher; as it has now acquired more strength. As soon as the haulm begins to decay in autumn, the roots must be taken up, carefully dried under an airy shed; whence they should be conveyed as speedily as possible to a kiln; and managed in a manner similar to that followed with malt or hops; because the beauty of the colour greatly depends on the expedition with which it is prepared. From the kiln, the madder is conveyed to the *pounding-house*, where it is pulverised; in which state it is fit for use.

Madder is employed in considerable quantities for dyeing a fine red colour, and likewise as a first tint for several other shades: if wool be previously boiled in a solution of alum and tartar, and then immersed in a hot decoction of tartar only with this drug, it will acquire a very durable, though not beautiful, red tinge.

M. Margraaff obtained from madder a permanent *lake* of a fine red colour, which is applicable to every purpose of painting. He directs two ounces of the purest alum to be dissolved in three quarts of distilled water previously boiled in a clean glazed vessel, which is to be set over the fire. As soon as the solution begins to simmer, it ought to be withdrawn, and two ounces of the best Dutch madder added; after which the mixture is to be boiled once or twice, removed from the fire, and filtered through clean white paper. The liquor, thus strained, is now suffered to subside for a night; when the clear fluid must be poured into the glazed pot, heated over the fire, and a strained solution of salt of tartar gradually introduced, till the madder be wholly precipitated. This mixture is next to be filtered, and boiling distilled water poured on the red powder, till the fluid no longer acquires a saline taste. It now remains only to dry the lake, which will be of a deep red colour; but, if two parts of madder be used to one of alum, the shade will be still deeper; and, if one part of the latter article be added to four of the former, it will produce a beautiful rose colour. See also Red.

[A more permanent and better colour will be produced thus: to 4 oz. of the best Zealand, or Crop Madder, add one gallon of water at the temperature of 100° of Fahr. in which you have previously dissolved one ounce of pearl ash. Let it be stirred occasionally during three days, keeping it in rather a warm temperature. Dissolve 2 oz. of alum (pure and containing no iron) in half a gallon of water: pour off and filter your solution of madder, and to that solution, add your alum liquor. Let the sediment subside: wash it well with warm water, and dry it on a filter.—T. C.]

The root of the Common or Wild Madder, is an excellent detergent and aperient; on which account it has been highly recommended in visceral obstructions, particularly of the uterus; in coagulations of the blood, induced either by falls or bruises; in the beginning of dropsical complaints; and especially in the rickets. It may be given pulverised, in doses from five to fifteen grains to children, and from half to a whole drachm, three or four times a day, to adults. When taken internally, it possesses the remarkable quality of tinging the urine with a deep red colour; and produces similar effects on the bones of animals, if eaten among other food.

Madder thrives in the state of Pennsylvania, and doubtless will thrive in every part of the union. It is an accommodating plant, being a native of Persia, and yet flowering in the moist cold climate of the Batavian Republic. The province of Zealand is almost entirely covered with this plant, whence it is exported to every part of Europe and America, yielding almost incalculable profits. It is understood, that madder flourished formerly in South-Carolina, but little or no attention is paid to it at present.

[The Smyrna madder in roots is the best kind for the Turkey red: it can be raised to great profit from New-York to Virginia.—T C]

MADNESS, or *Mania*, one of the most distressing afflictions which humbles human nature. It is usually divided into two kinds, *melancholy*, and *raving*; but as they are so nearly allied to, and frequently alternate with each other, we shall treat of both in one connected view.

The distinguishing character of melancholic patients, is a gloomy and dejected countenance, for which no real cause can be assigned. They are seized with fear and trembling, so that it is difficult to raise their animal spirits. The violence of the disease depends on the different subjects that prey upon the mind, which is extremely variable; inquiring after the most trivial matters: the habit is costive, the face pale, the pulse small and weak, while the stomach is distended with flatulency, and the appetite is uncommonly voracious. With respect to those strictly denominated *maniacs*, their condition may be ascertained by their bold and resolute aspect, while their eyes are suffused with blood; by the tremulous motion of the eye-lids; an unaccountable aversion to particular persons or things; acuteness in hearing; and by their almost continual wakefulness. Those hapless individuals who have become *raving mad*, in consequence of fear, generally continue under the influence of that passion. Such are the most striking symptoms, which vary towards the decline of the disorder; the victims of which are dull and stupid;

or sorrowful, melancholy, and sensible of their mental derangement.

Causes:—These are various, and often complicated, but may be aptly divided into two classes, namely, *mental* and *corporeal*. To the former belong love, fear, terror, pride, hope, joy; too ardent enthusiasm for liberty, or other passion that absorbs every faculty of the mind; too intense or too long continued meditation upon any person or subject; an ill-founded dread of the divine vengeance, occasioned by superstition, or false principles of religion, &c. Among the *corporeal* causes are blows, wounds, ulcers, bruises, or water in the head; congestions of blood in the brain; phrenzy, or inflammation of that part, from whatever accident; too sedentary a life; the taking of poisons possessed of narcotic powers; suppression of the proper or natural evacuations, of cutaneous or other disorders; sensual excesses; schirrous or glandular obstructions of the mesentery, &c. Madness is in certain families hereditary; and a slight degree of it is sometimes perceptible after the small-pox, intermittent, nervous, or other fevers.

Peculiarities:—Uncommon strength of limbs; almost total insensibility not only to cold, but likewise to stripes, however severe; and an inability to support the exhalations of aromatic substances. As the disease is periodical, the patient is particularly affected during certain changes of the moon, and in the spring. Farther, maniacs are not liable to be attacked by any of the prevailing epidemics; on the contrary, they are frequently cured of their former complaints, or the progress of such disorders is at least suspended, during the continuance of their insanity.

Cure:—If madness be the consequence of any other malady, its removal should be attempted by nourishing diet; clear air; gentle exercise, and the moderate use of wine. But, where this disease is hereditary, or has gradually increased from the patient's infancy, it becomes incurable: a similar fate generally awaits those persons, whose violent attacks, from whatever cause they may originate, have resisted every effort of art, beyond the space of twelve months.

In the earlier stages of madness, blood-letting, either in the arm or jugular vein, according to the strength of the patient, has been found eminently serviceable; but, if he be weak, or much exhausted, leeches may with advantage be applied to the temples. Considerable benefit has likewise been derived from emetics, such as ipecacuanha for more weakly constitutions, and antimonial wine, or tartarised antimony, for the more robust. The hot-bath; partial or total immersion in cold water, unexpectedly; purgatives; diuretics; and vitriolated tartar, have all been found occasionally useful in the progress of this disorder. Camphor has also been highly recommended; but it does not appear to be very efficacious. According to Dr. LOCHER, distilled vinegar has been successfully given to maniacal patients, whom it throws into profuse perspiration; and he observed, that they more speedily recovered, when the sweating was excessive, and of long continuance.

Formerly, the deplorable victims were chained, and scourged, lest they should injure themselves and others: a more humane treatment now prevails, and we trust that the *strait waist-coat* will always render such harsh conduct unnecessary, as it answers every purpose of restraining them from mischief. It will, however, be advisable uniformly to maintain an ascendancy over the patient, by a commanding deportment; as he will thus be impressed with a due sense of subordination, and submit to whatever regulations may be adopted for his safety, or restoration. Independently of this coercive treatment, attempts have been made to mitigate the violence of the disorder, by the liberal use of narcotics, especially of opium, which others have *forbidden*, as tending to increase the derangement. Instances, however, have occurred, in which large *doses of that* drug have effected a cure, when administered both externally and internally, either alone, or combined *with* camphor and nitre. Professor HUFELAND observes that tickling the nostrils with a feather dipped in laudanum, has afforded great relief during a fit of furious madness. A pillow stuffed with fresh hops has also, in many instances, composed the patient, and induced a salutary sleep.

The diet of persons labouring under this dreadful malady, ought to be uniformly light and thin; their meals should be moderate, and consist for the most part of nutritive vegetable food, especially during a *course of* physic. Their hours of employment must be regular, and their amusements adapted to their natural disposition: lastly, when the disease appears to be ubdued, it will be requisite that the atient drink the chalybeate waters, nd resort to the cold bath; as both emedies are eminently calculated to trengthen his whole frame, and to seure him against a relapse.

[I consider it as a point now settled mong the latest and most approved riters on Insanity, that there is no uch thing as a disease of the MIND. We know nothing of the mind, or of the ntellectual faculties, but through the ntermedium of the body. *Nil unquam fuit in intellectu, quod non prius erat in sensu.* If we had no eyes we should have no sensations or ideas of seeing: if no ears, of hearing: if no nose, of smelling: if no tongue or palate, of tasting: and so on. That is, without the organs of sense, we should have no *sensations* from the immediate impressions of objects on our senses, nor any *ideas* from the reminiscence of past sensations. But without sensations and ideas, there can be no comparison of sensations and ideas, or reasoning: no conclusions from such comparison, or judgment: no determination thereon, or will, volition: no recurrence or recalling (that is, no presence voluntary or involuntary) of past sensations or ideas, for by the postulata they never existed; and therefore no reflection. That is, no evidence of mind or intellect; that is, no mind or intellect; for that whereof we have no evidence of its existence, does not exist to us. For the physiological facts that are the foundation of this train of reasoning, I refer to every writer on insanity within ten years past, particularly the writings of MR. HASLAM; to HARTLEY's Essay on Man; to the work of CABANIS, Rapport du morale avec le physique de l'homme, and the Ideology of DESTUT TRACEY. I know too, that this was the opinion of the late Dr. RUSH; as indeed is manifest throughout his Treatise on the Diseases of the Mind. Hence it follows, that Insanity is essentially a disease of the bodily organs, and that the cure, if at all, must consist in the cure of a bodily disease. This opinion gives hope of cure in this dreadful disorder; but if Insanity were a disease of the mind, as it is called, it is in vain to apply to physicians or to medicine, for who can prescribe to a mind diseased? How can a dose of GLAUBER's salts operate on the soul?

In all cases whatever, legitimate reasoning can only proceed, by applying the analogies of cases that we are well acquainted with, to cases that are dubious: according to the poet, "How can we reason but from what we know?" Now, the cases of Insanity in its various degrees that have been decidedly traced to organic derangement, or some form of disease—and that have been cured by acting in conformity with this theory, are so numerous, that we have a right to apply them to cases of Insanity generally. Indeed, unless upon this supposition, the exhibition of medicine, and the erection of lunatic hospitals, are acts of rank folly.

Insanity may be considered either as *Mania*, or furious madness: *Melancholia*, or melancholy madness: *Idiocy*, or folly and incapacity: *Lunacy*, or derangement with lucid intervals, periodical or otherwise: for many diseases have a tendency to assume periodicity.

Mania, *Melancholia*, and *Lunacy*, may arise, and have been traced to

1. Original, organic malconformation.

2. Organic derangement of the brain and nervous system, from exciting causes acting on predisposition, hereditary or induced.

3. Organic lesion of the brain itself.

4. Morbid action in the brain or nervous system, originating therein.

5. Inflammation of the brain, its coats, membranes, or vessels:
- acute, producing *Phrenzy*.
- chronic, producing *Mania*.

6. Morbid action of the brain and nervous system arising from sympathy.

a—With distant parts in an inflamed state, producing *delirium*, usually with intervals of reason.

b—With diseased liver.

c—With diseased stomach.

d—With diseased bowels, worms.

7—Metastasis of chorea s. viti, erysipelas, cutaneous eruptions, measles, hysteria.

8—Or Morbid action arising indirectly,

From excess of alcoholic liquors.

From poisonous narcotics.

From obstructed evacuations, as menses, hemorrhoids, issues, &c. or repelled eruptions.

From febrile diseases, as apoplexy, gout, puerperal and uterine affections, &c.

From venereal excesses, a common cause.

9. Passions of love, grief, fear, anger, intense study.

10. The morbid prevalence of some ideas or trains of ideas, producing belief or persuasion out of the natural

and usual course of thought and reflection. I include these mental affections, as they are termed, among bodily disorders, because in fact, all these mental phenomena, are resolvable into bodily affections, as HARTLEY, CABANIS, CONDILLAC, TRACEY, and HASLAM, have shown.

Idiocy, may arise from

Original malconformation, hereditary or otherwise.

The debility induced by previous disease; or by old age.

Excess in the indulgence of natural appetites, particularly the venereal.

The Goitre, as in the cases of Cretins.

Habitual intoxication, with liquor, with opium, or other narcotics.

In the examination therefore of a physician as an expert, upon questions of Insanity, Idiocy, and Lunacy, the medical witness ought to be examined whether he has traced or endeavoured to trace, the mental derangement, to bodily disorder, so as to ascertain the probability of recovery; whether there be lucid intervals: how it is distinguished from eccentricity, hypochondriasis, &c.

No physician can give satisfactory evidence, who does not bear in mind these circumstances; and weigh the effect of these causes when they may have occurred. In ascribing intellectual or mental phenomena, to bodily organisation—and in tracing sensations and ideas to motions in the brain, or sensorium of the nervous system, which are there felt or perceived—I pretend to advance no opinion as to the power, faculty, or being, that there feels or perceives these impressions or motions in the nerves and sensory; whether the result of organisation, or distinct therefrom. RUSH on the Diseases of the Mind, second edition, p. 10, 11—T. C.]

MAGGOT, the common name of the fly-worm generated in flesh, from the egg of the large blue flesh-fly, known under the name of *blue-bottle*. Its body is white and fleshy, destitute of legs or feet, and composed of a number of rings, similar to those of caterpillars; and the insect is capable of assuming various figures, being at times more or less extended in length, and consequently of a greater or smaller size, according to its different contraction.

Although we are not acquainted with any remedy, by which meat or cheese infested with maggots may be recovered, and rendered fit for use, yet we shall suggest a simple expedient for preventing the generation of such vermin. In hot climates, where the flesh of animals undergoes putrefaction within a few hours, it will be advisable to cover the meat with the leaves of the Swallow-wort (*Stapelia variegata* and *hirsuta*), natives of Africa; or with those of the Fetid Goose-foot or Orache (*Chenopodium olidum*), either of which possess a very fetid smell, that attracts the oviparous flies to deposit their eggs on these leaves, mistaking them for putrid flesh; but, as the young brood cannot subsist on vegetable food, they speedily perish. FUNKE remarks, that a couple of flies, according to a probable computation, may produce in one year, two millions of descendants.

MAGISTERY, a name given to almost every precipitate obtained by solution, as opposed to *calx* or *oxyd*, which is procured wholly by calcination: it is chiefly employed to denote such precipitates as are used in medicine; for instance, the magistery of bismuth, coral, crabs-eyes, &c.

Magistery of Bismuth is a fine powder, prepared by dissolving bismuth in nitrous acid, and pouring on it a large quantity of pure water, which precipitates the magistery to the bottom of the vessel. It is chiefly employed as a cosmetic by the gay and giddy, on account of the superior beauty and dazzling whiteness which it imparts; but it is very pernicious to health, and eventually injures the skin. It has lately been given as a remedy for indigestion, but without much effect.

MAGNESIA, or *Magnesia alba*, a kind of absorbent earth, first discovered in the commencement of the 18th century. When pure, it is extremely white, loose, and light, being infusible, as it resists the heat of the most powerful burning lens. This earth, however, easily melts with borax; and is divested of its fixed air by calcination: in this state, it is less soluble than before, and does not effervesce with acids, but it may be safely taken internally.

Native magnesia is not found in quantities sufficiently large and pure for general use. It is therefore prepared by dissolving separately equal portions of Epsom salt and pearl-ashes, in double their quantity of warm water, when the sediment is to be strained: the two liquids are now to be mixed; adding eight times their proportion of warm water. The whole is suffered to boil a few minutes, being carefully stirred with a wooden spatula, to prevent the powder from adhering to the bottom of the vessel. Now the liquid is to stand at rest, till the heat be somewhat diminished, when it should be filtered through a cloth, on which the magnesia will remain: lastly, it is to be washed till it be totally divested of its saline taste

White magnesia is of considerable service for preventing or removing many disorders of children, especially of such as are troubled with a redundance of acid in the first passage; for which purpose it is preferable to the calcareous absorbents. It is often, and very properly, conjoined with rhubarb; so that children above one year old may take from five to ten grains of the former, and from one to two grains of the latter; while adults generally require one or two scruples of magnesia, and from five to ten grains of rhubarb for a moderate dose. See also HEARTBURN.

[Magnesia, the specific remedy for acid indigestion, is best taken in the common state of a carbonate: about four tea-spoonfuls as a dose, with a glass of hot toddy or brandy and water sweetened taken after it. It is a sure temporary remedy for the sick head-ach of females. Magnesia can be dissolved in the Seltzer water in the common machine for making it. There should be about 50 grains to half a pint, with sugar. This is a most wholesome beverage for acidity in the stomach and bowels.—T. C.]

MAGNET, or LOADSTONE, in natural history, a very rich iron ore, found in large detached masses of a dusky iron-grey, often tinged with brownish or reddish; and, when broken, appearing something like the common emery, but less sparkling. It is very heavy, considerably hard, of an irregular and uneven surface. Its structure is firm, but, usually, with some porous irregularities within. It is found in England, and all other places where there are iron mines. [It attracts metallic iron and steel, and *perhaps* nickel.—T. C.]

MAGNET, *artificial*, a steel bar impregnated with the virtues of the magnet, so as to possess all its properties, and be used instead of the natural loadstone.

The distinguishing properties of the magnet are, 1. Its attraction of iron, as well as every matter containing ferruginous particles; and 2. Its inclination to the poles. Hence it is of essential service in navigation, and is employed in constructing the mariners' needles, both horizontal and inclinatory. As this subject, however, is but distantly connected with our plan, we shall merely state the most simple method of making *artificial magnets*, which possess the virtues of the genuine loadstone, and have been found very useful in extracting particles of iron from the eye and other delicate parts of the human frame. CAVALLO directs the scales, which fall from red-hot iron, when hammered, to be reduced into a fine powder and mixed with drying linseed-oil, so as to make a stiff paste; when it may be moulded into any form required. This mixture is to be put in a warm place for some weeks, till it become perfectly dry, and hard; after which it may be rendered powerfully magnetic by the mechanical application of the magnet. But this friction of the two metals should be performed in a direct horizontal line from north to south; by which simple process, if continued for a sufficient length of time, even two flat pieces of iron or steel may be easily imbued with the magnetic fluid, so as to evince, in a considerable degree, the properties of the genuine loadstone, without having been touched by the latter.

[The process, however, requires certain precautions too minute to be detailed here, which may be seen in CAVALLO's Treatise on Magnetism, in IMISON's School of Arts, and most of the treatises on natural philosophy.—T. C.]

In order to increase the attractive power of the native magnet, it is frequently *armed*, that is, cased, capt, and provided with thin iron plates or bars, after its poles have been polished and properly regulated. Thus, it will support a weight 20, 40, nay 100 times greater than it could bear in its natural state; and, by loading it with ponderous bodies, its force, instead of being diminished, is considerably improved. On the contrary, by charging a loadstone with an inadequate weight; exposing it to heat, rust, and lightning; by keeping it in an improper direction to the poles, or frequently dropping it on the floor, it virtues will soon be diminished. See LOADSTONE.

MAGNETISM, explains the properties of the natural magnet, and shews by what means artificial ones are made. All magnets attract iron, and other substances that contain iron: this is called their *attractive* power. When a magnet is at liberty to move freely it constantly turns the same part towards the north pole of the earth, and the opposite part towards the south pole. This has been termed its directive power. The ends of the magnet are called the poles, which are denominated north and south according as they point to the north or south pole, and when a magnet places itself in this direction, it is said to traverse. When a magnet is left at liberty, its two poles do not lie in a horizontal direction, but one inclines downward, and the other is elevated upwards. This is called the *inclination* or the dipping of the needle. If a magnet be placed on cork, and allowed to float freely on water, with no iron near it, it places itself in the magnetic meridian. This is the property which renders it of so much use to seamen. The natural direction of the magnet is towards the northern and southern parts, yet it rarely points due north and south, and the difference is called the declination, which is said to be east or west according as the north pole of the needle is eastward or westward. The attraction of the magnet and iron is mutual, that is, the iron attracts the magnet as much as the magnet attracts the iron. The attraction of every magnet is strongest at the poles, and in the centre point between the poles there is no sign of attraction whatever: here the attraction of the two poles seems to balance one another. This attraction is not diminished by the interposition of other bodies, except iron. Put a needle on a pewter plate, and it will follow the magnet which is moved on the outside. When a piece of iron is brought within a certain distance of a magnet, it becomes itself a magnet, that part of it which is nearest the south-pole of the magnet is a north pole of the iron, and vice-versa. An artificial magnet, or a magnetic needle, is made by fastening the steel on a piece of board, and drawing magnets over it several times, from the centre to the ends. The power of a magnet is not diminished by communicating its properties to other bodies. Two or more magnets joined together may communicate a greater power to iron or steel than either of them possesses singly.

The Mariner's Compass consists of a box which contains the card or fly, is circular, and made of wood, or brass, or copper, and is suspended within another box by means of concentric circles, called gimbals, so fixed by cross axes to the two boxes, that the inner one or compass box shall retain an horizontal position in all the motions of the ship, while the outer box is fixed with respect to the ship. The card is a circular piece of stiff paper, the outer edge of which is divided into 360 parts, or degrees, and within the circle of these divisions, it is again divided into 32 parts called rhumbs, or points of the compass.

The Azimuth Compass differs from the common sea compass in this, that the circumference of the card or box is divided into degrees; and there is fitted to the box an index with two sights, which are upright pieces of brass, placed opposite each other, having a slit down the middle of them, through which the star or sun is viewed at the time of observation.

Magnetism, *Animal*, a sympathy which was lately believed to subsist between the magnet and the human body; and, in consequence of which, the former was supposed to be capable of curing almost every disease.

This fanciful system was originally invented by Father **Hehl**, of Vienna, though first brought into general notice, in 1776, by M. **Messmer**, who realised a princely fortune in France, by imposing his doctrines on the fanatical and credulous: his pretended mysteries were at length completely developed by a committee of learned and ingenious men, who were appointed to investigate his pretensions. Although this successful juggler refused to explain the principles of his art, yet from the account of one of his most eminent pupils, it appears, 1. That animal magnetism is an universal fluid, pervading the whole creation, and forming a medium of mutual influence between the planets; and also between the earth and animal bodies. 2. It is the most subtle fluid in nature, being capable of flux and reflux; and of receiving, propagating, and continuing all kinds of motion. 3. That the animal body is subject to the influence of this fluid by means of the nerves, which are immediately affected by it. 4. It operates at a distance, without the intervention of any person. 5. That, notwithstanding its universality, there are certain animal bodies, which are not equally susceptible of this fluid, and the presence of which even destroys the effects of animal magnetism. Lastly, it cures all nervous disorders *immediately*, and others *mediately*: in short, its virtues extend to the universal cure and preservation of mankind!

Such are some of the principles of this wild and incoherent *system*, the fallacy of which has been so clearly pointed out, that we should have assigned it to oblivion, had not a *similar farce* been lately obtruded, and is still opeating on the biassed part of the public. We allude to Dr. PERKINS's Tractors; certain metallic, or even wooden points, which professedly charm *all pain* from he bodies of animals, in whatever part t may be situated.

MAGNOLIA, a genus of trees comprehending several species, most of which are natives of the United States. 1. *M. acuminata*, or Cucumber-tree, Long-leaved-Magnolia. The cones or seed vessels are about three inches long, and resemble somewhat the cucumber in shape, but are in part of a bright red colour. They are a common ingredient in bitters, which they render very warm and pungent. They are used to cure the rheumatism, when infused in spirits.

2. *M. glauca*, Swamp Sassafras, Sweet Bay, Beaver Tree. It grows naturally in low moist ground, chiefly in the southern states; but becomes more regular, and thrives better in a high dry situation. From an experimental inaugural dissertation, published by Dr. PRICE, Philadelphia, 1802, it appears, that the operation of the *M. glauca* is similar to that of gentian and columbo roots. The bark of the root is very astringent, and in all diseases where invigorating remedies are required, deserves the trials of physicians. MARSHALL (*Arbustrum Americanum*) says, the bark and berries have been used with success in rheumatism. Mr. BARTRAM informed Dr. MEASE, that the root in decoction, has been equally useful in the same complaint.

3. *M. grandiflora*, Ever-green Laurel, grows to the height of eighty feet in Carolina and Georgia: and is one of the most beautiful ever-greens. Mr. BARTRAM thinks it exceeds every other known vegetable when in flower. It is to be regretted, that it will not bear the cold of Pennsylvania.

The bark of the root was used as a substitute for the Peruvian bark in intermittent fevers, in S. Carolina, by Dr. LINING.

4. *M. tripetala*, Umbrella Tree.

5. *M. auriculata*, supposed to be a variety of M. FRAZERI.

6. *M. pyramidula*.

7. *M. excelsior*. They all flourish in the open ground of Pennsylvania, except the *M. grandiflora*, and deserve to be cultivated for their beauty, and the fragrance of their flowers.

MAGPIE, or *Corvus pica*, L. a crafty, and well known British bird, which is about eighteen inches in length, and weighs from eight to nine ounces. It has a black bill, wings, and tail; but the latter are variegated with white, green, purple, and blue of different shades.

Magpies construct their nests with art, making a thorny cover, and leaving a hole at the side for admittance: the female deposits six or seven pale greenish eggs, thickly spotted with black. Similar to the crow, this bird feeds indiscriminately on both animal and vegetable substances; and, like the raven, it steals shining objects, such as buttons, knives, coins, and precious stones; which it carefully conceals in its nest. Magpies not only destroy young ducks and chickens, but suck and empty the eggs in a hen's nest. When reared from nestlings, they become exceedingly familiar, and learn to talk many sentences, as well as to imitate every noise within hearing. For the best method of taking them we refer to the article CROW.

MAHOGANY, or *Swietenia*, L. an exotic tree growing wild in South America, and likewise in the Islands of Cuba, Jamaica, Hispaniola, and in those of Bahama. It was formerly very common in Jamaica; whence it was first imported to London in the year 1724; since which period it has been very generally employed for household furniture. Lately, however, it has become more scarce and expensive: because the low-lands in that island has been gradually thinned of those valuable trees which could be readily carried to market, or transported on ship-board.

The mahogany tree grows very tall and straight, frequently among bare rocks, and attains a size of four feet in diameter: its wood is hard, admits of a fine polish, and is excellently calculated for chairs, tables, desks, and similar articles. It also affords strong and durable timber, and is usefully employed in the West Indies for beams, joists, planks, boards, and shingles. Ships built of this wood are said to be almost impermeable to cannon balls, which lodge in the wood, or, if they pass through the planks, occasion no splinters. The fresh bark of this tree has often been used in medicine, as a substitute for the Peruvian, and with equal success.

Substitute for Mahogany.—The difficulty of procuring mahogany and other precious woods, and the consequent exorbitant prices demanded for the ordinary articles of family convenience, has occasioned the art of the chemist to be applied to a subject peculiarly calculated to promote domestic establishment at a trifling expense. It has been contrived to render any species of wood of a close grain, so nearly to resemble mahogany in the texture, density, and polish, that the most accurate judges are incapable of distinguishing between this happy imitation, and the native produce. The first operation as now practised in France, is to plane the surface, so as to render it perfectly smooth; the wood is then to be rubbed with diluted nitrous acid, which prepares it for the materials subsequently to be applied. Afterwards one ounce and a half of dragon's blood dissolved in a pint of spirit of wine, and one third of that quantity of carbonate of soda, are to be mixed together and filtered; and the liquid in this thin state is to be rubbed or rather laid upon the wood, with a soft brush. This process is repeated with very little alteration, and in a short interval afterwards, the wood possesses the external appearance of mahogany. When this application has been properly made, the surface will resemble an artificial mirror, but if the polish becomes less brilliant, by rubbing it with a little cold drawn linseed oil, the wood will be restored to its former brilliancy.

Balls for beautifying Mahogany.—Melt 12 ounces of bees-wax with four ounces of mutton tallow; then add to them one ounce of red sanders wood, in fine powder; and form the same into balls. If the mahogany has spots of ink, grease, &c. first rub them out with vinegar and very fine brick-dust with a cork, and afterwards wash with warm water. When rubbed dry, a little of the ball is to be put on flannel, and rubbed well into the pores of the wood, and with a brush into carved work; wipe it off with a clean cloth; repeat this in a day or two, and the wood will receive a beautiful polish.

MAIDEN HAIR, the Common, Milt-waste, or Spleenwort, *Asplenium Trichomanes*, L. an indigenous perennial plant, growing on old walls, rocks, and shady, stony places; flowering from May to October. Its leaves have a mucilaginous, sweetish, sub-astringent taste, without any peculiar odour: they are reputed to possess considerable efficacy, in disorders of the breast proceeding from viscid and acrid humours, when taken in the form of an infusion or decoction: hence they have been recommended for promoting the expectoration of tough phlegm, and removing obstructions of the viscera.

Maiden-Hair, the Great Golden, or Goldilocks, *Polytrichum commune*, L. an indigenous perennial plant, growing in woods and moors, in wet boggy places; flowering in the months of May and June. The branchless stem of this moss frequently attains the length of eighteen inches; and, being covered with many long and soft leaves, it may be advantageously employed for besoms and brushes. Linnæus remarks, that the wandering Laplanders construct their couches of this elastic vegetable; and, according to Steller, the inhabitants of Kamtschatka employ these stalks as wicks in their lamps made of earthen ware.

MAIZE, Guinea-wheat, or Indian Corn, *Zea mays*, L. See Corn.

MALIC ACID, is discovered in the juices of many kinds of fruit, particularly in apples, hence the term Malic, from *malum*, an apple. The common houseleek affords abundance of this acid. It combines with earths, alkalies, &c. and the compounds are called Malates.

MALLOW, or *Malva*, L. a genus of plants consisting of 53 species, four of which are natives of Britain: the principal of the latter is the *sylvestris*, Common Mallow, or Mauls, growing in hedges, foot-paths, and among rubbish, flowering from June to August. The leaves of the Common Mallow possess a mucilaginous, sweetish taste, and were formerly often used in food, with a view to prevent costiveness. At present, decoctions of this plant are sometimes prescribed in dysenteries, and urinary complaints; though it is chiefly employed in emollient cataplasms, clysters, and fomentations. The flowers are eagerly visited by bees, which obtain from them an abundant supply of honey.

All the species of mallow, both indigenous and exotic, are beautiful plants, well calculated for ornamenting gardens, and affording grateful food to cattle; as they may be easily propagated by seed. But there are three, viz. the *Crispa*, or Curled Mallow; the *Peruviana*, or Peruvian Mallow; and the *Mauritiana*, or Mauritian Mallow; which, when macerated like hemp, afford a thread much superior for spinning, to that obtained from the latter vegetable; and the cloth made of the three species before mentioned, is said to be more beautiful than that manufactured of flax. From the curled mallow, which produces the strongest and longest fibres, excellent cordage and twine have been procured; and M. De

Lisle fabricated a new kind of paper from different species of the mallow, which not only served for the purposes of writing and printing, but also appeared to be eminently useful for drawing, and for the hanging of apartments.

Mallow, the *Marsh.* See Marsh-Mallow.

MALT, in general, is the term used to describe barley which has undergone the process of malting; for the purpose, chiefly, of being converted into beer, ale, barley-wine, vinegar, or spirits. But, by the process of malting, every species of grain, and many other substances, are or may be converted into malt; which then is to bear the specific name: as wheat malt, oat malt, &c. In making malt, that of barley being alone now meant, the grain is first steeped in a very large cistern of soft water till it swells, becomes somewhat tender, and tinges the water of a bright reddish brown colour; which, in warm weather, is frequently the case at the end of 24 hours. The water being then drawn off, and left to drain at least 12 hours, the barley is spread in a heap about 2 feet thick on part of the malting floor; where it naturally heats, and begins to grow, by first shooting out the radicle. At this critical period, the utmost care is to be taken, as the internal part soonest attains its acquired growth, to shift the whole gradually, in the mean time, by changing continually their relative positions, till an equal degree of growth prevails. This must by no means exceed the putting forth all the five roots to the length of at least an inch, when, as the green blade or spire might soon be expected to spring forth, which would destroy the substance of the malt, its growth must be instantly checked, by throwing it with a shovel, and spreading it as thin as possible all over the floor, every 3 hours, till the grain be completely cooled, and the roots deadened. This accomplished, the malt is to be put up into large heaps; and left to malt, or heat and sweat, till it seems almost to burn or scald the hand when thrust into the middle of the heap, which is seldom in less time than 36 hours. The heaps are now to be repeatedly thrown thinly over the floor, for the grain to cool and dry; which, then, is to be taken to the kiln. At this stage of the business it becomes necessary to decide on the character which the malt shall bear, in other words, whether it shall be what is called a pale or high dried malt. If pale, a gentle fire is to be made, and continued, taking care not to suffer the smallest appearance of smoke, so as gradually to dry and sufficiently bake the grain without at all browning it; which will be effected, if spread only 4 inches thick on the kiln, and occasionally stirred with an iron rake, in about 16 or 18 hours: when the malt is required to be high dried, a strong fire must be kindled and kept up, sufficient to dry and well brown it in 4 hours; during which time it must be often raked, to prevent its being in the smallest degree burnt. Both the pale and high-dried malts, after being taken from the kiln, are alike to be stored in heaps, sacks, &c. till wanted to be ground, or broken, for sale or consumption. By this, or a similar process, any other grain may be readily and effectually malted. Malt being, in general, by no means the better for long keeping, after it is ground, or cut in pieces by the mill, most great brewers purchase it unground; and having a mill of their own, grind it only as it is wanted. Mills of different constructions are used for grinding malt, according to the notions of the respective parties as to the superiority of effect for the required purpose, a mill composed of ? iron cylinders, however, which break the malt without cutting its husk, so that the hot water instantly penetrates its entire substance, and soon draws forth a rich infusion, with much less mashing than in the common way, is one of the simplest, and perhaps the best, of all these new inventions for general purposes. To judge of the quality of pale malt, a grain of it may be bitten asunder; and if it taste mellow and sweet, breaks soft, and is from end to end full of flour, it can scarcely fail to be good.

The goodness of high dried malt depends chiefly on its scent, colour and taste. Malt should be made in a cool place, so that the steeping should require about 36 hours. The whole process of malting ought to take from 18 to 21 days. During the first ten days that the malt is thrown on the floor, the heat ought not to exceed 60°. of Fahrenheit's thermometer; during the next 3 or 4 days, it may be permitted to rise gradually from 60 to 67°, and then during 6 or 7 days more, it may be brought up to 86°, and then sent to the kiln.

MAMMALIA, in the Linnæan system of zoology, the first class of animals, comprehending such as *suckle* their young. This class is divided into seven orders:

I. *Primates*, animals that have two canine teeth, and four cutting teeth. Of this order there are only three genera; man, the monkey, and the bat.

II. *Bruta*, animals that have no cutting teeth; as, the elephant.

III. *Feræ*, animals that have from two to ten cutting teeth; as, the lion.

IV. *Glires*, animals that have only two cutting teeth, and no canine teeth; as, the hare.

V. *Pecudes*, animals that have no cutting teeth in the upper jaw; as, the sheep.

VI. *Belluæ*, animals with cutting teeth in each jaw, and which are furnished with hoofs; as, the horse.

VII. *Cete*, or *whales*.

[MAN. An animal of the LINNÆAN class MAMMALIA: erect, and two-legged, with two hands. The better opinion is, that from the combined length of the upper and fore-arm, and the formation of the hand as it is called in man, apes, monkies, and ourang-outangs are quadrupeds.

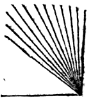
It is not a characteristic faculty that man reasons: it is sufficiently ascertained that other animals reason also, as dogs, horses, elephants. Nor that man forms abstract ideas, for we know not the facts in this respect as to the capacity of other animals.

Man, cooks his food, uses tools, and is musical. There is no good reason to believe that any other animal has these properties or propensities.

There are several varieties of man: it is doubtful whether there be more than one species, inasmuch as the progeny of intermingling varieties breed. This question depends upon another, whether the capability of begetting and bearing offspring, which is possessed by the progeny of intermingling varieties, is a characteristic of species.

Varieties of man, are either *geographical*, as the European, Asiatic, African, American, and Polynesian; or dependent on colour, as the European white, the African black, the Asiatic tawney and olive, and the American Indian, copper-coloured; or dependent on the osteology and other decided marks of different conformation.

Then, draw a straight horizontal line, on which the tip of the chin shall rest, and then a line grazing the forehead and touching the lips externally till it meets the horizontal line; this is the facial line of CAMPER. In the finer Greek statues, this line will form an angle with the horizontal line, which will exceed 90 degrees, and extend as far as 95: in the average of European heads of the temperate climates, it will vary from 90 to 80. In the Asiatic, from 80 to 75: in the American from 75 to 70: in the African negro from 70 to 60: in the ourang-outang from 60 to 50: in the monkey tribe, from 50 to 40: still less in birds, until it becomes nearly parallel: thus



With respect to the characteristic of species above given, it appears difficult to reconcile it with the breeds of dogs: but as yet we have no better.

There are strong osteological and physical differences, not easily reconcileable to varieties from climate or accident. Let any one read the very curious account of the Bosches-man (not the Hottentot or the Caffre) in the summary of science in the first vol. of WALSH'S *Am. Ann. Reg.* and he will greatly doubt if they are to be classed with mankind. As to the negroes, the differences are many, but perhaps hardly marked enough to form more than a variety. In a negro, for instance, the cheek bones are more prominent, the nasal bones less prominent, the skull bones thicker and harder, the jaw bones larger, and the masticatory muscles more powerful; the bones of the chin recede from the perpendicular, while those of the European advance toward it; the fore-arm is longer, the hand flatter, the bones of the fingers longer, the thigh bones and front bone of the leg gibbous, the bones of the heel longer, the foot flatter, the hair woolley, the lips thick and prominent, the nose flatter and wider, the skin black from a black *rete mucosum*, which cannot be shewn in white men; the skin also is black in parts never exposed to the sun, as the scrotum.

The stature of man is on the average, 5·7 or 5·8, but it varies from 8·6 to 2·6.

The life of man, is now as in the time of DAVID, from 65 to 70, but it has been extended, as in JENKINS and PAR, to 150 years, and beyond.

Whether the human race is derived from one pair, is not expressly decided by scripture, as will be found on a *careful* perusal of the first chapters of *Genesis*.

Blumenbach divides the races of men, into the Caucassian, the Mongol, the Ethiopian, American, and Malay: a division, which prevails apparently among the men of science in Germany. See the works of professor Camper, professor Sommering, and Dr. White, of Manchester.—T. C.]

MANAGE, or **Manege**, an academy, or place for learning to ride the great horse, as also for breaking horses to the proper motions and actions. In every manage is a centre, or place destined for vaulting round a pillar; a course, or career, for running the ring; and on each side, pillars, between which are placed the horses destined for high airs.

MANDRAKE, or *Atropa mandragora*, L. an exotic plant, growing in Spain, Portugal, Italy, and the Levant: it is propagated by seeds, and treated in a similar manner with the more tender exotic plants. According to Bechstein, the carrot-like root of the Mandrake, in its native climate, penetrates from three to four feet deep into the soil, where it remains sound for fifty years. The plant is divided into *male* and *female*, the vegetation and growth of which are alike in both: though the leaves, roots, and seeds of the latter are longer, narrower, and of a darker colour than those of the male.

The fresh root of the mandrake is a powerful purgative, and may be taken in doses of from ten to twenty grains in substance; or from half a drachm to a drachm in infusion. It has been found very serviceable in hysterical complaints, but ought to be cautiously used; for, if administered in too large quantities, it occasions convulsions, and even proves deleterious. The mandrake possesses narcotic properties, and is sometimes employed in emollient cataplasms and fomentations, for discussing hard tumours and swellings.

MANGANESE, in the state that we see it, is a black oxide of a metal which has only of late years been discovered, and in very small quantities, in the neighbourhood of Foix, in the Pyrennean Mountains. This metal is described to be of a silvery grey colour, of leafy or foliated texture, and somewhat more than six times as heavy as water.

Mines of manganese have long been worked in several parts of Great Britain, but particularly in the counties of Devon and Somerset. Near Exeter and in the Mendip hills this mineral is found in great abundance.

It is employed for various useful purposes. In the manufacture of the finer kinds of glass it is used in a double capacity, both as a colouring material and as a destroyer of colour. As a colouring ingredient the imitators of several precious stones are indebted to it for the red and purple tints which they give to the oriental ruby, the balass ruby, and the amethyst.

The violet colour given to porcelain is obtained from manganese. It is also used for the glazing of black earthen ware, as a paint, and an ingredient in printer's ink. As a discharger of colour it is applied in small quantities, and, by the oxygen which it gives out, it is said completely to destroy any tinge left in the glass, by the presence of iron, and some other colouring matters. This property has obtained for it the appellation of the *soap of glass*.

It is from manganese that all the oxygen gas used by chemists is obtained. By the application of a red heat this is yielded in such abundance that an ounce of the oxide of this metal will yield about two quarts of gas. The consumption of manganese has, of late years, become more considerable by the discovery of the oxygenated muriatic acid, which is now very extensively used in the bleaching of linen and cotton, that liquor being made by the distillation of the oxide of manganese with spirit of salt (muriatic acid.)

MANGE, a disease affecting dogs and swine, in a manner similar to the itch in the human body; and arising from an insect that works its way beneath the uppermost skin; where it causes so great an irritation, that the animals rub or scratch themselves, tearing off the head of the pustule, which occasions a scab, and, in a short time, an ulceration. This disorder, especially in dogs, originates from too high feeding, want of exercise, and an opportunity of refreshing themselves with dog's grass; from being starved at home, so that the animals are compelled to devour carrion and excrements abroad; from want of water, or neglect of cleanliness in their kennels. It is induced in swine, by suffering them to lie in their styes, without clearing away their ordure.

As the malady is entirely situated in the skin, the cure may be effected in dogs, by giving them a small quantity of fine pulverised sulphur, either in milk, or incorporated with butter, and rubbing them daily, for the space of a week, with an ointment consisting of sulphur and hog's lard; to which should be added a small portion of oil of turpentine. Another remedy is obtained by boiling four ounces of quicksilver in two quarts of water, till the quantity be reduced to one half: with this liquid the animals are to be washed regularly, and ought also to take a small draught of it every day, during the continuance of the eruption.

With respect to the mange in hogs, Dr. Norford (*Annals of Agriculture*, vol. xv.) recommends the following ointment, which seldom fails to effect a perfect cure, provided it be properly applied, and the animals be kept clean, after the disease is removed:—Take three ounces of hog's-lard, one ounce of fine flour of sulphur, two drachms of white hellebore, newly pulverised, and half an ounce of the water of kali, prepared in the shops. These ingredients are to be thoroughly incorporated, so as to form an unguent; the whole of which is directed to be rubbed on the animal at one time, and is said to be sufficient for a hog of six or seven stone: if the ointment be properly applied, there will be no occasion for any repetition. Should, however, a slight cough affect these quadrupeds, after the cure is performed, it will be necessary to give each, according to its size, from half an ounce, to an ounce and a half, or even two ounces of crude antimony, properly levigated and mixed mith some of his daily food, for the space of ten days or a fortnight, by which simple remedy, the hogs will be effectually restored.

When these animals have been long neglected, their necks, and various other parts of the body become affected with loathsome chaps or cracks. In this case, the best remedy is, to anoint the ulcerated parts every three or four days, till they are healed, with a little tar-ointment, prepared by dissolving equal parts of tar and mutton suet over a gentle fire, and straining the mixture while hot. But the most certain preventive of the mange, and its subsequent disagreeable effects, is the strictest attention to the health and cleanliness of the animals. For this purpose, every part both of the kennel and of the stye ought to be thoroughly swept, before they are littered with fresh straw; nor should a clean bed be spread over a foul or dirty one, as is too frequently the case with careless and negligent servants; who, regardless of their master's interest, thus eventually cause the destruction of many valuable dogs and swine.

Mange, in *farriery*, a cutaneous disease, to which horses are occasionally subject: it arises from poor feeding, and is therefore chiefly found in such cattle as are kept by the lower classes of people.

This disorder is easily known by the tawny appearance of the skin, which is thick, and full of wrinkles, particularly on the mane, loins, and tail: the ears and eye-brows, as well as the diseased limbs, are totally divested of hair; while the little still remaining on those parts, is very stiff and bristly.

If the mange be contracted by infection, it may be easily removed by anointing the horse daily with a salve prepared of sulphur and hog's-lard; at the same time giving him sulphur and antimony for some weeks after the eruption has disappeared. But, if the disorder originate from low feeding, and thin, impoverished blood, the diet must be changed, and the horse allowed a proper quantity of sweet hay and corn. Hence the animal's food should consist of warm mashes composed of equal parts of malt, or oats, and of bran, to each of which ought to be added four ounces of honey, and one ounce of sulphur. These are to be given every night and morning, for the space of a week or ten days, during which the horse should receive a measure of dry corn at noon: an ounce of nitre is likewise to be dissolved in water, and given every night and morning, during the taking of the mashes. At the expiration of that period, his diet should be changed to good oats and sweet hay: the corn be moistened with water, and a dose of the following incorporated with it, every night and morning: Take a pound of sulphur, and an equal portion of prepared antimony; let them be well mixed in a mortar, and divided into twenty-four doses.

With respect to the external treatment, every infected part ought, previously to the commencement of the mashes, to be carefully washed with a pailful of warm water, in which a quarter of a pound of soft soap has been dissolved, so that all scurf and filth may be completely removed. The animal is then to be gently dried, and on the succeeding morning, every disordered limb is to be anointed with the following preparation: Take half a pound of strong mercurial ointment; three ounces of pulverised white hellebore; one ounce of black pepper in powder, and a similar quantity of oil of tartar. The whole must be incorporated with a sufficient quantity of sweet-oil, to give it a proper degree of softness; and the unguent should be repeated for seven, or ten days, or even a fortnight, according to the urgency of the symptoms, or the virulence of the eruption. The powders of sulphur and antimony, as well as the nitre, ought to be continued for three weeks, or a month; and, lastly, when the horse appears sufficiently invigorated, he should lose a small portion of blood, and afterwards swallow, at different times, two mild purgatives, by which a complete cure will be effected.

MANGEL-WURZEL, or ROOT OF SCARCITY, the *Beta altissima*, L. is an exotic variety of the *Beta Cicla*. It is propagated from seeds, one or two of which are deposited, in the month of April or May, in holes dibbled at the distance of from eight to eighteen inches asunder.

The white and red-streaked roots of this plant are large and fleshy; affording excellent fodder for cows, to whose milk and cream they communicate a delicious flavour.

The Mangel-Wurzel produces abundance of leaves, which are greatly relished by horses, sheep, cows and hogs; for the two last mentioned animals, however, it is necessary to cut them off the plant: because they are said to refuse eating the fresh herbage from the roots. These leaves, being remarkably tender, are dressed on the Continent of Europe in the same manner as spinach. See BEET and SUGAR.

In those parts of Germany where the Root of Scarcity is cultivated, farmers prefer it to potatoes, turnips, carrots, and every other vegetable for feeding cattle: as both its root and leaves are free from the depredations of insects; but they acknowledge, that the animals do not fatten so readily on this as on the vegetables above specified. Although the Mangel-Wurzel has not answered the high expectations that were formed of its utility in Britain some years since, it is a valuable plant, and deserves the attention of agriculturists; as there is no doubt that in certain soils, and in particular situations, it may prove a most useful article for the purposes above stated.

[It is worth cultivating. The root is insipid and unpalatable, but the stalks, and strong middle part of the leaves, may be stewed as asparagus.—T. C.]

MANGLE, a valuable domestic machine, employed for the purpose of smoothing such linen as cannot be conveniently *ironed*.

There are various forms of Mangles in England; the most approved of which is that lately introduced by Mr. JEE, who was rewarded by the Society of Arts in London, 1778, with a silver medal, for his improvement. It is described and illustrated in their transactions for the above year.

Mr. JEE's mangle is so constructed, that the handle requires to be turned one way only, in consequence of which the machine moves with greater facility, and with incomparably less injury to the linen, than by varying the turnings, and in a manner cutting the different folds. Besides, it possesses the great advantage, that a woman and one boy are sufficient to work it, and can perform as much labour in the same period of time, as three or four persons with mangles of the common construction.

Mangles are highly useful in preventing the necessity of ironing all plain articles of linen or cotton, which is a serious and laborious task in a warm day in the United States, and the source of much indisposition among females.

MANGO-TREE, or *Mangofera*, L. a native of the East Indies, whence its unripe fruit, preserved in vinegar, is imported under the name of *mangoes*.

This lofty tree attains a considerable size: its fruit, when fully ripe, is as large as a goose egg; and greatly esteemed in the East, on account of its invigorating odour, which is said to restore the health of persons in a declining state. Beneath its rough shell, there grows a kernel similar to that of almonds, and which may be eaten either fresh, or preserved: from the expressed juice, the Indians prepare wine; and the remainder produces excellent flour.

Every attempt to propagate the mango-tree in Europe, has hitherto failed; and MILLER is of opinion, that the stones will not vegetate, unless they be planted shortly after the fruit is ripe. He therefore suggests the expedient of importing the young plants from India, in boxes filled with earth; so that they may afterwards be kept in the tan-bed of a hothouse.

MANNA, the juice obtained from several species of ash, particularly the *Fraxinus rotundifolia* and *Ornus*, growing in Italy and Sicily. When naturally concreted on the tree, this juice is called manna in the *tear*; but if it exudes on straws or chips of wood affixed to the tree for that purpose, it is called *canulated*, or *flaky* manna.

This drug, commonly sold in the shops, is obtained by making incisions in the tree, after the spontaneous exudation has ceased: it consists of larger masses, and is of a deeper red than that which flows without wounding the tree.

The best Calabrian manna is imported in oblong, light, friable flakes, or pieces of a whitish, or pale yellow shade, and somewhat transparent. The inferior sorts are moist, unctuous, and of a darker colour.

Manna is a mild and agreeable laxative, which may be safely administered to children and the aged; though, in some constitutions, it is apt to induce flatulency, and to distend the bowels; but this inconvenience may be remedied by the addition of a little cinnamon water, or other warm aromatic. The dose for children is, according to their age, from one to three drachms; and for adults, one ounce, or one ounce and a half: as, however, its operation, when taken by itself, is very mild, and sometimes imperceptible, it is generally given in laxative mineral waters, or combined with salts, senna, rhubarb, or similar aperient medicines.

MANSLAUGHTER, a species of homicide, denotes the unlawful killing of another, without any malice, either expressed or implied.

MANUFACTURE, signifies a commodity, or piece of workmanship, produced from raw materials, whether by hand, or by the aid of machinery.

The extensive utility of manufactures to a commercial nation, is generally acknowledged; and it is a circumstance worthy of remark, that the greatest improvements have, in general, proceeded from persons of no liberal education.

MANURE, denotes any substance employed for improving land, whether by remedying its natural poverty, or by correcting its too great stiffness, looseness, or other qualities unfavourable to vegetation.

[The following general observations on manure, may furnish more accurate ideas than commonly prevail on the subject.

Writers on agriculture, ignorant for the most part of the physiology of animals, as well as vegetables; have usually considered and treated of plants, as inanimate beings: they are not so. Every plant is the production of an organised seed, endued with the property of vegetable life, and of being acted upon by appropriate stimuli. This vegetable life is originally excited and subsequently continued by the application of what may be called *natural* stimuli, much in the same manner as in animals. Thus the pollen of the pointal received by the chive, and thence propagated to the seed vessel, impregnates the seed, and excites the action of the living fibre, which afterwards proceeds according to the laws of organisation peculiar to each plant. This action is continually renewed by the application of vegetable food, by means of which the germ is dilated till the plant arrives at its full growth. All this is perfectly analogous to the impregnation of the animal germ in the ovarium and its subsequent growth to full size and age.

In animals the muscular fibres have the property of contracting on being irritated, (*irritability* as it is called,) so have vegetable fibres: the sensitive plant, the hedasyrum, the dionea muscipula of Carolina; the phenomena of plants growing in a dark place and turning to the light, are proofs of this, if not of voluntarity. The separated twigs of hedasyrum are irritable like a separated muscle. Mr. HOWARD has lately discovered the same property in the pollen on the application of alcohol. (*Transactions Linn. Society, London.*)

Animals have feeling, perception, or *sensibility*, and the power of voluntary motion. So (as some think) have plants. The facts adduced by PERCIVAL, SMITH and DARWIN, and the whole class of phenomena relating to their search of food and the propagation of their species, seem to render this probable. To which may be added the habits and customs of the parasite plants.

Animals, though perfect *in all their* parts, may be stinted in their growth, by too small a quantity of food and by other means; and this *diminution will* affect the size of their offspring. The case is precisely the same with plants. By a plenty of food, and favourable situations, animals may be increased in size. So may vegetables. By breeding from selected couples of a large size, the size of the animal offspring is increased. Hereon was founded the successful practice of the greatest cattle breeder in England, Mr. BAKEWELL, of Dishly; and the same set of experiments has been repeated with equal success on plants by Mr. COOPER, of New-Jersey. Mr. BAKEWELL increased the flesh on particular bones of his cattle, and propagated this propensity. Mr. COOPER has, in like manner, propagated not *merely* increase of size, but increase of size in particular parts of the plant, and propensities to earlier vegetation.

In animals, appetite may be provoked and digestion assisted by the artificial stimuli of what physicians call condiments, salt, pepper, wine, acids, bitters, &c. Such also is the property of vegetables. Their hands, mouths, and stomachs, are in the soil; and by the application of artificial stimuli, such as lime, common salt, alkalies, plaister of Paris, &c. their roots may be excited to want, to seek, to take in, and to digest more nutriment than they would otherwise take in.

Animals may be surfeited with too much nourishment. So plants will die, if set in a mere dung heap. Animals may be poisoned. So may plants. Every metallic combination, for instance, except oxygenated and carbonated iron,[*] the calx of manganese (and lead,[†]) and in small quantities, being poisons to the vegetable.

By the artificial stimuli of condiments, animals may be excited too much, and indirect debility will ensue. So is it with plants. In like manner excess of these artificial stimuli will take away their beneficial effects, as half a pint of wine may assist, when a bottle will injure digestion. Thus from the experiments of Sir JOHN PRINGLE, and Dr. WATSON (bishop of Landaff,) it appears that a small quantity of salt is a septic to the animal fibre, and a manure to vegetables; while a large quantity is the domestic antiseptic of cookery, and destroys vegetation altogether. So in the experiments of judge PETERS, two bushels of gypsum will produce a luxuriant crop, and six or eight will prevent it.

In animals, when parts of muscular or other fibres are weak, diseased, and dying, artificial stimuli can be applied to excite an action in the living and healthy parts, by which the dead are separated and sloughed off. So in plants, the artificial stimulus of those substances, which are not manures in the sense of affording nourishment to the plants, but only exciting a stronger and more healthy action in the living fibre; will kill the weak and diseased roots, while they invigorate the more healthy. This is the mode of action (in part) of lime, gypsum, salt, &c. usually classed among manures, but which do not enter into the composition of the plant itself.

Animals are resolvable into lime, gases and phosphoric acid. There is no peculiar animal earth. The phenomena of marine animals, the experiments of VAUQUELIN on the production of lime in the hen, and some other facts, make it probable that the lime of the bones, as well as their phosphoric acid, is the product of animalisation. Vegetables are resolvable into gases and fixed alkali by fire; by putrefaction their alkali is decomposed, and escapes in the form of volatile alkali, for no fixed alkali is found on the incineration of vegetables which have undergone completely the putrefactive process. Both vegetables and animals contain in their fluids, accidentally, unessential quantities of iron, manganese, and neutral salts. Thus the blood contains iron, the serum and urine, microcosmic and phosphoric salts with the bases of lime, soda and volatile alkali. So in plants, nitre is found in borage, in nettles, &c. and ozalites in some. Hence it appears that the component parts of vegetables are very nearly the same; indeed the gases into which they are each resolvable form nineteen-twentieths of their weight. We are aware of the experiments and observations, as yet inconclusive, of VAUQUELIN, GIRTANNER, HUMBOLDT, and LAMPADIUS, on the decomposition of alkalies and earths by means of oxygen; and although they are not yet satisfactory, we may fairly assert the probability of the conversion of lime into alkali, and that the difference of organisation alone, makes that to be lime in an animal which is alkali in a vegetable.

Again: Animal fibres are made from plants. So true is the scripture exclamation, that all flesh is grass! An ox and a sheep are made up of vegetables, and so are we who devour them. Nothing is nourishment to an animal, but what was originally a vegetable. In like manner, nothing is nourishment to a vegetable, but what enters into the permanent composition of a vegetable. We find that large plants grow in pure sand, (VAN HELMONT,) in sand and clay, in common clay, in lime-stone, lime-stone and sand, lime-stone and clay, and in all the combinations of these common earths: but we do not find that these earths, or any one of them, are permanent and essential parts of the composition of a plant, any more than of an animal. In a human body of 200lb. weight, may be found about the fourth or fifth of an oz. of common salt, and *perhaps* the same proportion of gypsum may be found in clover; but these are accidental parts of the composition. Hence manures of *nourishment* are distinguished from manures of *stimulus*, and from *mechanical* manures; and we are taught, that every vegetable and animal substance, when decomposed, furnishes pabulum to vegetable, and that every such substance so decomposed is a manure of nourishment, and that nothing else is, or can be. It may be taken for an axiom, that from man to a cabbage or a lichen, nothing can be converted into nourishment for the living fibre, but what has been a permanently component part of living fibre before.

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[*] This combination was found highly useful as a manure by Mr. JOSEPH WHITTEN of Kent, Litchfield county, Connecticut, for all garden vegetables. It answered better for Indian-corn, than either ashes or gypsum. See *Med. Rep.* vol. II. p. 440.—Dr. MEASE.

[†] Sir J. BANKS was unable to make *arenaria verna* grow in his garden, until he procured the dross of lead, and surrounded the plant with it. See ANDERSON's *Recreations*, vol. I.—Dr. MEASE.

There are other properties of vegetables similar (rather than analogous) to those of animals, which the necessary brevity of this compilation will not admit. It may be observed, however, that plants, like animals, may be transplanted from one climate and soil to another, provided the difference be not very great, and care be taken to accustom them gradually to the change. Indeed, vegetables, like animals, will accustom *themselves* to the change in a generation or two, provided the difference be not above 8 or 10 degrees of latitude, or of mean temperature. The range is not yet ascertained.

On the preceding properties of vegetables and their analogies to animals, may all the agricultural doctrine of manures be well founded. These analogies have been remarked by others, but their application in this respect has not been heretofore sufficiently observed.

Animals *differ* from vegetables in having a more extended sphere of locomotion. The animal (except in cases nearly zoophytical,) can move the whole of his body from one place to another; a plant can only move its root, fibres, and its branches. The *convolvuli*, and other parasite plants, are in some degree an exception, but the general rule is, that the immoveable centre of a plant's situation is the place where the germ falls, or the seed or plant is set with intent that it should remain. Hence the use of that kind of manuring which consists in the admixture of soils of various depths and adhesion, for the mechanical purpose of keeping the plant steady.

II. Of the climate and soil.

No experiments have been made to ascertain with precision the bounds of latitude or temperature which prohibit the naturalisation of exotic plants. (See article PLANT.) In France, YOUNG has marked the lines of the maize and the vine culture. In this country maize grows tolerably well from lat. 42, and beyond it to Georgia. Wheat is not so good and productive south of Virginia, as in the middle states. The latitudes of cotton and rice are not yet exactly ascertained. (See article COTTON.) Coffee has not yet had a fair trial in our southern states, nor the sugar cane. Much indeed yet remains to be done in this respect, and much is doing by the British government in the West-Indies.

Agriculturists have many vague denominations of soil, such as clay, loamy, marley, sandy, lime-stone, gravelly, stoney, poor light soil, rich black soil. These are tolerably descriptive in a general way; but as the theory of the art improves, we shall need more accuracy. Of the primitive earths, none need be noticed under this section, but silex or sand; argil or clay; and calx or lime. The others have never been yet found in sufficient quantity to produce any notable effect, except in the hurtful quality of magnesia when combined with lime, first noticed by Mr. TENNANT. It is evident that for the mechanical purpose of increasing or lessening adhesion, supporting the plant, and admitting its fibres to shoot more freely; clay, sand, and lime-stone are mutually manures to each other, acting mechanically by their mixture. Thus in Cheshire and Norfolk, in England, the clay and marl pits furnish an excellent and permanent manure to the sandy soil above.

But it is not merely the mechanical mixture of soils that may be useful; for the experiments of M. D'ARCET and M. FABRONI have shewn us that in the temperature of 100° of Fahr. different earths have different capacities for retaining moisture; so that by judicious admixtures, this valuable property in soils may be increased or diminished; and as none of the earths are found perfectly pure in soils, (clay, for instance, retaining 66 per cent. of sand without losing its distinctive character) a field is opened for ascertaining this property in different admixtures and combinations. For Mr. WEDGEWOOD discovered that earths would chemically combine in the moist way.

Besides the tenacity of soils, and their capability of retaining moisture, their *depth* is also to be considered by the cultivator. Some plants have long tap-roots, such as rhubarb, liquorice, carrots, parsnips, madder, &c. These are evidently unfit for any soils, but of loose adhesion and of considerable depth. Equally preposterous would it be to use a soil like the Genesee flats, of twenty feet deep of rich mould, for grasses that spread upon the surface. Again, where soils are naturally sandy, dry, and arid, and the climate warm, plants should be selected, whose roots penetrate deep and beyond the influence of atmospheric evaporation. Thus, in this country as in the south of France, lucerne, (*medica*) and chicory (*cichorium intubus*) would be luxuriant where no other grass would grow.

We come now to consider (in this sketch III) the mode of accelerating the growth and increasing the size of plants.

This is done by *manures*. Hitherto, every substance added to the soil or to the plant while growing, which effected, or was meant to effect these purposes, was called a manure. But, from what has been said, manures ought to be considered in at least three divisions. 1. Manures of nourishment. 2. Manures of stimulus. 3. Mechanical manures.

Manures of nourishment. Five different theories have been started on this subject.

1. Practical men have for ages discovered the use of dung in agriculture, and hence the common and oldest theory was, that the juices of decomposed animal and vegetable substances were the chief pabulum of plants.

2. Van Helmont's experiment suggested *water* as the pabulum; but although some plants will live, none will flourish in mere water. The French experiment of the decomposition of water, and the discovery of the excretion of oxygen seemed to give countenance to this theory.

3. Dr. Hunter, of York, in his *Georgical Essays*, persuaded the world for some time, that oil was the pabulum of vegetables. But neither his theory nor his practice succeeded.

4. Dr. Priestley, who had more right to form theories and conjectures than any man living, (because he has furnished more facts of extensive application in chemical philosophy than any other man,) suggested that *phlogiston* was the pabulum. Some experiments of Arthur Young, made in consequence of this supposition, tend to support it. But though in all probability *inflammable gas* may be converted into nutriment to vegetables, yet it is far from being true that this is the only gas which can. The gases that escape from a dunghill are surely entitled to consideration; but, of these, inflammable air or hydrogen is but a small part; azote, carbonic acid, alkaline air, carbon, and carburetted hydrogen, and perhaps sulphur, dissolved in alkaline air, are parts of the products of this decomposed mixture. We know too, that oxygen, carbonic acid, electricity, and the galvanic fluid, seem to aid vegetation to a certain degree: but the action of all these gases and fluids are more satisfactorily accounted for, on the doctrine of stimulus, than of pabulum, unless where carbon enters into their composition. That oxygen is not nutriment, is clear, from its being an excretion of plants in a healthy state, and in vigorous action, under the influence of the sun, as Dr. Priestley, and afterwards M. Ingenshouz discovered. It is evident, from numerous experiments, that plants take up watery fluids and juices; but there is no experiment that shews us, that they take up air of any kind, though they excrete it. Hence, although these fluids may contain the elements of phlogiston, or the combinations of phlogiston, this latter cannot of itself be taken as the food of plants. Both plants and animals are resolvable into gases, of which phlogiston may be a part, but there is something else which feeds and dilates the muscles of animals and the leaves of trees.

5. Dissatisfied with former theories, Mr. Kirwan has proposed carbon or charcoal as the food of plants; and declares his opinion that if charcoal could be rendered soluble in water it would be the most efficacious manure. It is true that charcoal is found in the incineration of all undecomposed vegetables, and that they most probably contain much pure carbon, but they contain also much alkali, much oxygen, much azote, nitrogen, &c.; nor is there any fact to prove that charcoal (or the oxyde of carbon) is either soluble in any liquid, or taken up as charcoal by any vegetable, or decomposed by any natural process;[*] soot as a top dressing

[[*] Arthur Young has shewn that carbon or charcoal may be dissolved in a boiling alis a tolerable manure in England, but its use may be accounted for from the saline substances it contains. Whatever be the pabulum of vegetables, appears from every fact hitherto known, to be generally exhibited in the form of a *liquid*. That liquid may contain, and indeed generally does contain, (if dung be employed) the bases of hydrogen, of fixed and volatile alkali, as well as azote, carbon, oxygen, and unascertained compounds of these. Hence it appears that, whatever theory of ingenious speculators be adopted as the simple and homogeneous pabulum of vegetable bodies in a living state, the old theory and the old practice must, and ought to prevail, namely, that the staple manure of nourishment is dung, (*i. e.*) *decomposed animal and vegetable substances;* and although it *may* be of use by dung-heaps to aid this decomposition, yet even in an undecomposed, or partially decomposed state, this gradual decomposition amounts in the end to the same thing. This is applicable to ground-bone, woollen rags, horn shavings, &c. All the difference is that *time is gained* by the artificial and complete decomposition of these substances, but at the loss of substance.

Manures of stimulus. Whatever accelerates the growth, or increases the size of plants, and does not actually enter into the composition and substance of the vegetable, can only be considered as a manure, by stimulating the healthy fibre of the plant, by destroying the dead and decaying fibres, and by assisting the decomposition of undecomposed animal and vegetable substances dispersed through the soil. It is thus that *gypsum* or plaister of Paris acts, being the most efficacious septic among the neutral saline substances. Of these manures of stimulus, none are as yet in common use but lime, gypsum, and common salt.

Lime is, limestone deprived of its water and carbonic acid by fire. In this state its stimulating powers are obviously much greater, than in its natural and neutral state of limestone. But even pounded limestone is a promoter of vegetation on clayey and sandy lands, and this earth appears to be a specific stimulus to white clover, and perhaps to the potatoe. Hereto may be referred the rubbish of old buildings, and marl, which is clay with about one half of limestone. See **Land** and **Lime**.—T. C.]

Common salt. This, until the duty of two thousand per cent. in England, was a very common manure in Cheshire; the facts relating to it, in this point of view, are collected in **Watson's** *chemical essays*. In this country, gypsum is much cheaper.

Gypsum, plaister of Paris, *vitriolated lime*, or *sulphat* of lime. This has not been certainly found in any plant, but by M. **Model**, accidentally, in rhubarb, (*Journ. de Phys*. vol. 6. p. 14,) even this we suspect to be a fallacy; *for the* characters of gypsum were not then well ascertained. About two bushels per acre to clover or corn seem to be a full quantity. It slowly attracts the moisture from the air, and dissolves gradually when strewed on the ground. It comes here from France and the bay of Fundy, and has also been lately found in New-Hampshire and on Lake Erie. There is also some in Maryland on the Chesapeake, about one hundred miles below Baltimore, at Cayuga Lake in the Genesee, and in the Sulphur Spring (so called) on the road from Canadaraqua to Geneva: at Abingdon also, in Virginia, gypsum usually accompanies the salt formation as in the Genesee country. As it is not a component part of any plant, either in whole or in its own component parts, it cannot act upon healthy vegetables but as a stimulus, and upon diseased and dead ones, by its septic power. Experiments remain to be tried as to other manures of this description.

Mechanical manures. Their action in giving depth by new addition; in giving tenacity by mixture, as clay with sand, or, *vice versa;* in giving capacity to retain *moisture*, on the principles suggested by the experiments of **Fabroni** and **D'Arcet**, is too obvious to require further elucidation.

Such are the ideas that occur as throwing some light on the theory of this complicated and most important subject, and suggesting the *rationale* of the application of manures in cases not hitherto well understood.

Gypsum particularly deserves attention, considering that it has effected almost a complete revolution in the agriculture of Pennsylvania. Many thousand acres of land hitherto barren, have been converted into excellent pasture ground, by its surprising influence. Even the products of land, tolerably good, have been doubled, and in some instances trebled by using it. The theory of its action was not until lately understood. Judge **Peters**, of

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kaline solution, which then becomes the most powerful of all manures. *Annals of Agr.*—T. C.]

Philadelphia, who first collected the opinions of our farmers on the subject of the gypsum as a manure, ventured to suggest, that the vitriolic acid was the fertilising principle of this manure. The chemists of our country either did not assent to the theory, or laughed at it. A fact however has been communicated by Mr. LIVINGSTON, formerly our minister in France, which would induce a belief in the theory.

"In an excursion," says Mr. LIVINGSTON, "I lately made into Flanders, I observed, at some distance from the road, several large beds of earth, that appeared to me to emit smoke and flame, which two men were tending. I stopped the post-chaise, and went to examine it. I found that it was pyrites sufficiently impregnated with sulphur to burn when dry. This was laid in beds and set on fire. They endeavoured to extinguish the fire when the ashes became of a red colour. If it burned longer, it became black, and the quality was not so good. This earth so burned, was easily reduced to powder, by a wooden mallet; and, in this state, was carried on the backs of asses forty or fifty miles as a manure, and was used, particularly for grass, at the rate of about six bushels the acre. The seed grain was also covered with it as with gypsum in our country. This circumstance induces me to believe, that the sulphuric acid is, both in this and in gypsum, the fertilising principle, and may suggest many other ways of applying that cheap material to the purposes of agriculture. It is very presumable that in this very slow combustion, the sulphuric acid is absorbed by the ashes, or other earths, while the inflammable matter is dissipated; and, that the union of the alkali and the acid forms a salt not unlike in its chemical relations, the gypsum, or perhaps one that is more soluble, more impregnated with the acid. Perhaps diluted vitriolic acid, directly applied, would be found equally useful, or rendered more valuable by being combined with wood ashes, when native gypsum could not be conveniently had. If I rightly recollect, DUHAMEL mentions that sulphuric acid scattered over weeds with a view to destroy them, made them grow with additional vigour. From the place where they were burning the earth, I proceeded to the ore bed, which I examined, and found the earth very similar to what I have seen in my own estate at Clermont, and which may indeed be found in many black meadows. Pyrites abounds in the United States; every farmer, therefore, ought to examine their estates for this substance with great care, as in all probability many of them contain treasures of this kind, of which the proprietors have hitherto been entirely ignorant."

[I have tried, without success, dilute sulphuric acid and sulphur, and I disincline to the value of Mr. LIVINGSTON's observations.—T. C.]

For the purpose of supplying adult vegetables with nourishment, we should first consider, says Dr. DARWIN, what kinds of matter are most prevalent or most necessary in their composition: what of these substances they can absorb without previous decomposition: and lastly, how to expedite the decomposition of vegetable and animal substances on, or in the soil, like the digestive processes in the stomachs of animals; we may thus become acquainted with the sources and the management of manures.

Vegetables by analysis afford three essential principles, carbon, or the oxyd of charcoal; hydrogen or inflammable air; and oxygen or pure air: the proportion of which, vary, according to the agents which have concurred to its development, and according to the matrix which received and assimilated them, in order to create those combinations which are varied almost to infinity, by their forms and properties, and known by the terms of salt, oil, and mucilage. It appears, therefore, needless to seek those combinations in the different substances which are used for manure, when we wish to determine the nature of them, and explain their manner of acting in vegetation, because supposing it true, that these salts, these oils, these mucilages, exist in their combined state, nothing but their constituent elements above-mentioned, can possibly have any action.

The substances which enter into the composition of plants, are, therefore, nothing but products of the decomposition of air and water, and combinations of the constituent principle, of these two fluids, determined by their power which presides in the seed, and which thence has passed into the plant.

Manure is usually divided into four classes, viz. Animal, Vegetable, Fossil, and Fluid.

I. ANIMAL MANURES comprehend the several parts of animals, such as their fat, dung, urine, &c.

1. *Dung.* Having already pointed out

the general properties of dung, under that article, we shall only observe, that the excrementitious matter of privies is supposed to exceed every other kind of manure, during the first year it is applied; in the second, its beneficial effects are less evident; and, in the third year they almost entirely disappear. The quantity necessary for land in a good condition is, by Mr. MIDDLETON, computed to be about two loads per acre, annually; which, in his opinion, will always preserve its fertility. He farther remarks, that exhausted ground may be perfectly restored, by laying on four or five loads of night-soil per acre, for the first year; after which, two loads annually will be found amply sufficient to keep the land in the highest degree of cultivation.

The matter of privies is known to be a most valuable manure. In China and Japan, there are laws to prevent its waste. The cultivators prefer it to the manure from horses and cattle, as it does not contain the seeds of weeds, and is much stronger than stable manure.

If the privies of families were lined with CEMENT, (which see) so as to retain the moisture, (the most enriching part); and if earth, fine sifted coal ashes, but more especially fresh slacked lime were frequently thrown down the privies, all disagreeable and unwholesome smells would be prevented, and the quantity and value of the compost greatly increased. By this management, its removal would be also rendered inoffensive to those employed.

From SIMONDE's *View of the Agriculture of Tuscany*, a very interesting work, it appears, that night-soil is as highly prized there, as in China and Japan; but he remarks the very disagreeable effluvia which exhales from it when spread upon the ground. It should *never* be used, except when joined with earth or vegetable matters, in the proportion of one to five or six.

2 *Fish.*—Herrings, pilchards, and mackrel, afford an excellent manure; being chiefly used in those parts of Britain where they are caught in the greatest abundance, and seldom fail to procure rich crops.

3. *Bones*, to which we refer.

It may be here stated, in addition to what Dr. WILLICH says on the utility of this article as a manure; that in England, the grinding of bones for the farmer is now a trade. Bones mixed in a heap of lime, will soon be reduced to powder, but the farmer should observe whether the same beneficial effect would result from the use of the bones thus treated, as when powdered by the mill. An experiment, upon a small scale, may be easily made.

[Bones, moreover, contain a great quantity of gelatine even in their dry state. This decomposes gradually. So that ground bones, or bone-dust, is a most valuable top-dressing. Latterly even human bones have been imported into England from Germany.—T. C.]

4. *Urine* is well calculated for manure: it is so far preferable to dung, as no seeds of weeds are deposited in the ground with the former; and, if the land be well watered with this fluid, such irrigation will be attended with the best effects.

5. *Horn shavings.* See HORN.

6. The *chippings* or scraps of skins and hides (being the refuse of furriers and curriers) are of great utility on land intended to be sown with wheat or barley. They should be scattered by hand on the soil, and speedily ploughed in; because any pieces, left on the surface, are immediately devoured by crows and dogs. The proper quantity of this manure is, two or three quarters per acre, which should be scattered a short time before the seed is committed to the ground: such chippings are peculiarly calculated for light dry soils, but are seldom productive of any benefit to wet or clay lands.

7. *Sheep's-trotters*, and fellmonger's cuttings, are employed on similar soils, though in the proportion of from 20 to 40 bushels per acre. They should likewise be ploughed in, to prevent the depredations of dogs and crows.

8. The soiled or damaged *locks of wool*, or trimmings of sheep, deserve to be more generally known as a fertilising article: they are at present chiefly used in England, for ameliorating the hop-grounds.

9. *Woollen rags* are an excellent manure; but, instead of being collected in a heap, similar to a dunghill, they ought to be cut into small pieces in a paper-mill; strewed by hand; and ploughed in, three months before wheat or barley is commonly sown: the usual quantity is from six to ten cwt. per acre; though, in some parts of England, a ton weight is spread on each acre, every third year, for hops. On account of retaining their moisture, such rags are eminently adapted to dry, gravelly, or chalky soils; the fertility of which will thus be considerably increased, especially during dry seasons. The

only obstacle to their more general adoption, appears to be the apprehension entertained by many farmers, of catching the small-pox by chopping and scattering the rags; but, since the virulence of that disorder may be subdued by vaccination, those fears are certainly groundless.

10. *Insects*. See that article.

II. VEGETABLE MANURES are either whole plants, or parts of vegetables, together with their ashes, &c. which are sometimes ploughed in, while growing, and are afterwards burnt, or otherwise decomposed.

1 *Wheat-straw*, according to Mr. BORDLEY, is a very valuable article; but it ought to be ploughed in, "when it is *muck wet* from soaking rains that have softened it;" for, if it be turned into the ground under less favourable circumstances, it is seldom of any advantage.

2. *Weeds*, such as dock-roots, cabbage-stalks, the roots of couch-grass, &c. are of great service: hence Dr. DARWIN pertinently remarks, that they should not be improvidently thrown into the highway, or consumed by fire, as too frequently happens: on the contrary, if laid on the ground in heaps, occasionally turned over, and covered with soil, they will inevitably perish, and speedily ferment, on account of the sugar and mucilage which they contain. The decomposition of weeds is still more effectually accelerated, on adding quick or newly burnt lime, by which they are rapidly converted into a most valuable manure. For this purpose, Mr. HENRY BROWN, an ingenious chemist, directs a layer of green vegetable matter to be formed, about one foot in thickness, on which a very thin stratum of pulverised lime is to be scattered; and such alternate layers are to be continued till the pile is of a sufficient height. When these materials have lain together for a few hours, a dissolution of parts will commence; and, in order to prevent the inflammation of the whole mass, a few sods, or a small portion of fresh vegetable matter, ought to be added. In the course of twenty-four hours, the process will be complete, when a quantity of excellent ashes will be ready to be laid on the land. Weeds and vegetables of every description, if used green, will answer the same purpose, and thus be productive of double advantage to the farmer; because they may not only be collected at a small expense, but will, in a few years, render his farm more valuable, by exterminating all noxious plants.

3. *Sea-weed* is a valuable manure for garden-grounds, and destroys every kind of vermin. The best is cut from the rocks on the sea-coast; but, as this marine vegetable is frequently thrown on shore, it may be useful to state, that the better kind resembles the haulms of peas; and the inferior sort is known by its long, shrub-like stalk: they may be either spread on the land, in a fresh state, or previously laid up in heaps, and suffered to putrefy.

Sea-weed is much used on the seacoast of New-York, as a manure.

River, or pond-weeds, and especially the *River-conferva*, are equally beneficial; being particularly calculated for turnips or wheat, if ploughed in upon a sandy soil: but they produce no effect on land that abounds with springs, or is liable to inundation: the quantity laid on varies from twelve to fourteen loads per acre.

Considerable benefit has likewise been derived from turning in vetches, buck-wheat, or rape, upon old-ploughed lands, which are thus greatly improved. Turnips, when injured by the frost, may also be employed as a valuable manure; because they are believed to prevent the germination of the seeds contained in weeds, which enter the heaps of dung; and, when stirred among the latter, promote their putrefaction.

4. The *ashes* of fern, stubble, peat, &c. of which we have already treated in our first volume. Article ASHES.

5. *Peat* is not sufficiently known as an article of manure. It is usually employed in a burnt state, for a *top-dressing*; but, as it is formed of the solid parts of morasses, and consists of vegetable fibres, more or less decomposed, it may be laid on clayey soils with the greatest advantage. Dr. DARWIN remarks, that peat ought to be considered as an inestimable treasure to the farms in its vicinity: he suggests the propriety of throwing it previously into heaps, either with or without the addition of lime; then exposing it to the air, and draining the water from it, in order to expedite its decomposition. [Peat is found in abundance on the Delaware about 3 miles from Philadelphia, and thence upward.—T. C.]

"PEAT, or MOSS EARTH, is a valuable manure. From experiments made with alkaline salts (potash) and peat, says DUNDONALD, it can be asserted, [? T. C.] that the effects of such a mixture, weight for weight, are equal, if not superior, to those of dung.

Peat, when intended to be used as a manure, should be dug up at the depth of two or three feet from the surface, in small pieces, and left exposed to the air for three or four months, or till the dry weather of summer, or the frosts of winter, render it convenient to carry it away.

From a meadow dressed with forty loads per acre, with a compost, made of three fourth parts of peat earth, and one fourth part of dung, greater and more lasting crops of hay were produced, than from the like quantity of the best dung.

The most beneficial preparations or combinations of peat will be found to be:

Peat-earth, with dung and urine.
Ditto, with alkaline salt, or potash.
Ditto, with lime.

When the soil does not contain a due proportion of calcareous matter, (as old meadows,) the two last are preferred, until it shall have received a due proportion of this article, so indispensably necessary to produce sweet herbage.

One hundred pounds of alkaline salt or potash, are sufficient to saturate peat-earth enough to top-dress an acre."

In order to prepare peat with lime to the greatest advantage, Lord DUNDONALD directs fresh lime, completely slacked, to be mixed with 5 or 6 times the weight of peat, which should be *moderately humid.* The heat will be moderate, and not sufficient to convert the peat into carbonaceous matter, or to throw off, in a state of fixable air, the acids therein contained. The proportion of lime should be carefully attended to, and the mixing of the two substances performed under a shed, as too much rain or too great exposure to air, will prevent the due action of the lime upon the peat.

This preparation is peculiarly favourable to the growth of clover, and short sweet pasture grasses. Alkaline salts are of much greater importance than lime, to mix with peat, as the peat is by them, rendered completely soluble.

6. *Rape-cake*, which is obtained after expressing all the oily particles from rape-seed. It affords, when pulverised, an useful manure for wheat. *Rape-dust* is equally serviceable as a top-dressing for turnips; and should be spread on the land in the proportion of 10 cwt. per acre.

7. The bark of oak, or rather *tanner's waste*, which has been suffered completely to putrefy, affords an excellent manure for cold, stiff, clay-soils; one load being more efficacious than a double quantity of the richest dung. If oak-bark be designed for grass-land, it ought to be spread shortly after the 29th of September, that the winter-rains may wash it into the ground: for, if applied in the spring, it will burn the grass, and exhaust, rather than ameliorate the soil, for that season. On the contrary, if intended for corn-fields, it should be spread immediately before the last ploughing, in order that it may be turned down, so as to come in contact with the early fibres or roots of the corn; because, when lying too near the surface during the winter, it unnaturally hastens vegetation; and, with the approaching spring, the young buds of the grain perish from the severity of night frosts.

III. FOSSIL MANURES consist of various kinds of earth, sand, chalk, marl, &c. all which, in a greater or less degree, contribute to the amelioration of land See CRAG, CLAY, CHALK, GYPSUM, LIME, MARL, and SAND.

1. *Coal-ashes* (see COAL) are of extensive utility as a manure. [Very doubtful.—T. C.] They are particularly adapted to clay-lands, for correcting their cold, ungenial quality; but they should not be ploughed in too deep. These ashes may likewise be employed as a top-dressing for clover, on dry chalky lands, over which they ought to be scattered in the months of March or April, in the proportion of from 50 to 60 bushels per acre: they have also been advantageously spread on *sward* or grass-lands, either in the winter, or during the spring.

2. *Soot*, which will be discussed in its alphabetical place.

3. *Clay*, when previously calcined or burnt, improves cold, wet, sandy soils; and has been found very serviceable to close, stiff lands. The excellence of this manure is very conspicuous in the North Riding of Yorkshire, where the ground is so sandy as to produce, with any other manure, only rye; with clay, it yields abundant crops of oats, barley, &c. The usual proportion, laid on meadow, pasture, or corn lands, is from ten to twelve loads per acre; and so permanent are its fertilising properties, that it becomes unnecessary to repeat the operation of *claying*, for the period of forty-five years.

4. *Sand*, to which we refer. [Clay is

mechanical manure for sand, aiding it o retain moisture, and manure, and to teady the roots of vegetables growing n it, and to prevent its being blown way. Vice versa, sand is a mechanical manure for clay soils.—T. C.]

5. *Salt* is justly asserted to be one of he most grateful manures to vegetaion, as cattle are not only more healhy but fatten more speedily on pasures, where it has been properly scatered. It is of great utility for raising urnips, as well as for producing abunlance of corn; the straw being strong; he grain *thin-hulled*, heavy, and on the whole, better than that from many other manures. Besides, it sweetens sour pastures; improves and increases the herbage: while it destroys all noxious nsects. The proper quantity is from 12 to sixteen bushels per acre; for, if a large proportion be used, its beneficial effects will be diminished, and vegetation be eventually destroyed.

IV. FLUID MANURES comprehend WATER; OIL-COMPOST; MUD (which see); and all liquid matters that are employed with a view to ameliorate land.

Under the article IRRIGATION, we have treated of the utility of water, and pointed out the best manner of applying it to the soil; we shall, therefore, at present, only remark, that the *liquor of farm-yards* has been successfully tried on meadows, and wheat-fields, both of which are thus rendered uncommonly fertile. This fluid may also be used with great advantage for land sown with barley, oats, or other grain; but, if it be intended for grass-land, it ought to be sprinkled on them only during the winter, when the rains wash the saline particles into the soil; or early in the spring, when the ground is laid up for hay; because no cattle will feed on the grass, while the salt or dung adheres to the blade. Farther, it will be necessary to convey this ameliorating liquor to the field during dry weather, when the dung-water in the reservoirs is of a deep-brown colour, and strongly impregnated with salt. Thus, the land may be irrigated as often as occasion may require; and the pools kept constantly empty, for the reception of fresh fertilising matter.

As manure promotes the growth of plants; as its fermentation and warmth disposes the soil for the more easy admission of nourishing moisture from the air; and as it thus eventually contributes to the support and comfort of mankind, the manner in which it is to be applied, merits some attention.

Every kind of manure, Mr. BORDLEY justly observes, ought to be carefully collected, duly sheltered, *and ploughed in, as speedily as possible after it has been carried to the field;* the implements and labourers being ready on the spot. He directs the loads to be ranged in *lengths;* the dung to be spread and immediately ploughed in, "line by line;" because it more readily dissolves in the ground when newly covered, and its whole strength is thus secured to the soil.

This is an important direction, for which there is much room.

Where the manure collected in heaps is to be ploughed under clayey soils, that are liable to become too solid and impenetrable to the fibres of wheat, or other plants; and also, where potatoes, or similar bulbous roots are intended to be turned in, with a view to produce a crop beneath the soil; Dr. DARWIN conceives the most advantageous method of using such compost would be, to bury it before it is perfectly decomposed; for it will thus prevent the surface of the land from becoming too firm: and, notwithstanding the putrefaction will consequently be somewhat retarded, yet the fertilising substances will in the end totally decay, and afford to the roots an equal, though more gradual, portion of nourishment. The most proper seasons for ploughing or turning in such manures, Dr. DARWIN agrees with Mr. BORDLEY, to be immediately before the seeds are sown, or the roots are set: because the atmospheric air, which is buried with the dung, in consequence of its union with carbon in the interstices of the earth, gradually evolves a genial heat, that greatly promotes vegetation.

With respect to those manures, which are to be spread on the surface of grass or other land, and which are called *top-dressings*, the most favourable season for applying them appears to be the early spring: when they should be spread over the soil in a state of coarse powder, or in small lumps which cohere but slightly; because the vernal showers will then wash them into the soil, so that the young stems of grass may easily penetrate.

"The application of *top-dressing*, as observed by Lord DUNDONALD, has been too little attended to, in consequence of farmers being unacquainted with the advantages resulting to the ground, when converted from pasture to arable, by previously promoting the most luxuriant growth of perennial grasses. By assisting vegetation, and increasing the vigour of perennial plants, their roots are made to strike deeper down, and improve the staple of the soil: with annual plants the same benefit is not to be expected, as their growth and decay are limited to one season; were manures exclusively applied, under a system of convertible husbandry, to grass grounds, the lands would regularly be broken up, in due rotation of cropping; and there can be no doubt, but that a greater quantity of corn (grain) and herbage would annually be produced; and it is very probable that wheat and other grain would be less subject than at present to diseases, many of which, there is reason to believe, are occasioned by the immediate application of dung previously to sowing. The articles most generally used in Scotland, as *top-dressings*, are lime mixed with rich black mould; lime mixed with peat, peat-ashes, coal ashes, and soot."

As, however, the proper mode of collecting and preserving manures is attended with considerable expense, the most economical manner of distributing it, requires no common skill. This object is in a great measure attained by the drill-husbandry, the principal advantage of which consists in putting the manure into *drills*. Mr. **Parkinson** (in his *Experienced Farmer*, vol. i. p. 32) directs such drills to be made at the distance of two feet from each other: thus, he sows wheat, peas, beans, and cabbages; from the result of which this intelligent cultivator maintains, that *four* loads per acre in the drill-husbandry, are equal to *sixteen* loads in the usual way of spreading it over the whole of the field.

MANUSCRIPT, signifies a book or paper written by hand, as opposed to those which are printed.

Having already pointed out, in the article **Deed**, the most easy method of restoring written characters that are almost obliterated. We shall at present state a simple contrivance by which, we believe, manuscripts may be rendered legible, though the letters be totally effaced. First, let the obliterated paper be slightly moistened with a sponge dipt in cold water, after which some galls finely levigated, are to be sifted over the paper. When it is perfectly dry, the powder should be gently shaken off, or removed with a soft brush; thus, part of it will adhere to the former outlines that still exist in the paper, and the letters will immediately reappear.

Couquebert has communicated to the *Philomathic Society of Paris*, a very simple process for taking a copy of a recent manuscript. The process is the more interesting, as it requires neither machine nor preparation, and may be employed in any situation. It consists in putting a little sugar in common writing ink, and with this the writing is executed upon common paper, sized as usual. When a copy is required, unsized paper is taken, and lightly moistened with a sponge. The wet paper is then applied to the writing, and a flat iron, such as is used by laundresses (of a moderate heat), being lightly passed over the unsized paper, the copy is immediately produced. [Indigo or lamp-black, ground up with gum-water, are useful additions to record-ink.—T. C.]

MAPLE-TREE, or *Acer*, L. a genus of plants, comprising twenty species.

1. The *campestris*, or **Common Maple**, which is a native of Britain, grows in thickets and hedges, and flowers in the month of June. The wood of this species is much used by turners, being far superior to that of the beech. When it abounds with knots, it is greatly esteemed by joiners, for the purpose of inlaying. On account of its lightness, maple-wood is also frequently employed for musical instruments: being remarkably white, it was formerly converted into tables, and other articles of domestic furniture, particularly cups; which last may be turned so thin, as to transmit light. But, at present, this tree is principally planted for hedges, and for underwood; because it is of quick growth, and affords excellent fuel. According to **Dambourney**, a decoction of the bark of the common maple, imparts to wool, prepared in a solution of bismuth, a reddish-brown colour similar to that obtained from woad.

2. The *Pseudo-platanus*. See **Sycamore-tree.**

Marshall, in his *Arbustrum Americanum*, enumerates the following native species of maple,

1. *Acer Pennsylvanicum*, dwarf mountain maple. It grows on mountains, and rises to the height of six feet; the leaves are three pointed, pretty much sawed on their edges, and placed opposite on moderately long foot-stalks.

2. *A. Glaucum*. Silver leaved maple, a tall spreading forest tree; leaves five lobed, deeply and irregularly sawed on

heir edges; they are of a lucid green on the upper side, and of a bright silver colour on their under side. The flowers are produced in little umbels at the foot of the leaves, are of a deep red colour, and exhibit a fine appearance.

3. *A. Negundo.* Ash-leaved maple. Rises to the height of twenty feet; the eaves resemble those of the ash, but are three or five lobed. The flowers of the male, are produced upon penduous bundles of very long fine footstalks, each having a small flower cup at its extremity. The females produce flowers at the extremity of the small branches, in long loose bunches.

4. *A. Canadense.* Striped maple. Is of a middling growth. The bark is beautifully variegated or striped. The eaves are divided into three very sharp pointed lobes; and finely sawed on their edges. The flowers are produced in solitary bunches, with short foot-stalks, and are of a greenish yellow cast.

5. *A. Rubrum.* Scarlet maple! Grows o a large size. The leaves are three and sometimes nearly five lobed, and sawed on their edges. The flowers are produced in little umbels closely surrounding the small branches, and are of a scarlet colour, and exhibit a very fine appearance early in the Spring. There is a variety of this with yellowish flowers and seeds, which is the most common kind in Pennsylvania. The wood is much admired for cabinet work, the grain being curiously waved and curled, which when polished or varnished, is highly ornamental.

6. *A. Sacharinum.* Sugar maple. A very large tree. The leaves resemble the *silver-leaved maple*, but are not so large, nor deeply lobed; nor of so fine a silvery white. The flowers are of an herbaceous colour. The wood of this species is esteemed for making saddle-trees, and other mechanical purposes. This species yields a greater quantity of saccharine juice, when tapped in the Spring, than any of the species of the maple. The best mode of making sugar from this juice, shall be fully described when we come to the article Sugar.

Maranta. See Arrow-Root.

MARBLE, in Natural History, a genus of stones that admit of a bright and beautiful polish: they are composed of small separate concretions, moderately hard; not emitting fire, when stricken against steel; effervescing with, and soluble in acids; and calcining in a moderate fire.

The finest modern marbles are those of Italy, Blankenburg, France and Flanders. In some of the Western Islands of Scotland, very fine specimens of this fossil have lately been discovered. [Put a pin in a map of the United States, (Arrowsmith's is the best,) at White Marsh, about 15 miles from Philadelphia. Stretch a string from thence north-eastward to Massachusetts, and south-eastward to South Carolina. Marble will be found every where along the line of that string, or nearly so.—T. C.]

When chemically examined, marble consists of calcareous earth united with fixed air; and is, like lime-stone, or chalk, convertible into a strong quicklime. Black marble derives its colour from a partial admixture of iron.

Great Britain produces, particularly in the counties of Derby and Devon, many varieties of marble, which are valuable for chimney-pieces, slabs, and other purposes. Marble from the neighbourhood of Petworth, in Sussex, was formerly much employed in architecture; but few of the British marbles have been more admired than that obtained from Tirie, one of the Western Islands of Scotland, which is of a reddish colour, and varied with darker shades, spots, and stripes.

White, or *statuary marble*, is brought principally from Italy, and its neighbourhood. The best is obtained from quarries in the island of Paros, and near the town of Carrara. The principal statues of *Parian marble* now extant are the Venus de Medicis, Diana Venatrix, and Venus leaving the bath. *Carrara marble*, the purest of all the kinds with which we are acquainted, has a granular texture, and sparkles, when broken, like sugar. During the late European war the exportation of statuary marble from the countries under the dominion of Buonaparte, was prohibited; and at one time it became so scarce in England as to be sold at the rate of more than seven guineas per cubic foot. The block of marble for the statue of George III. in the great Council Chamber at Guildhall, London, was stated by the public prints to have cost twelve hundred guineas. Parian marble was used in the construction of several of the buildings of Ancient Greece and Italy.

[Parian marble is the Lychnites of Pliny, so called because the quarry was worked by torch-light. Of this marble, the Venus de Medicis, and the Venus of the Capitol, are made.

Carrara marble, is the Marmor Lunense of PLINY: of this marble, the Antinous and the Apollo Belvidere are made. CANOVA prefers it.

Phengites is a semi-transparent marble.

The marble of Haddam, Connecticut, is the Serpentino of the Italians: of which the green is chlorite, the black hornblende, and the white is marble. It is not the Verde antiquo, which is a dark green paste of porphyry, with light green tabular chrystals of felspar. —T. C.]

The different varieties of marble are innumerable. They vary extremely in their colours and shades; and in general are named and distinguished by these. Many of them contain shells and corallines.

A kind of marble is brought from Switzerland, which, in thin pieces, is slightly *elastic*; and another from the neighbourhood of Mount Vesuvius, which is *luminous* when two pieces are rubbed together in the dark.

Black Marble has its colour from a combination either with iron or bitumen. In the latter case it exhales a pitchy odour when heated; and its impregnation with bitumen is, in some instances, so great, that the blow of a hammer causes it to emit an abominable smell. M. D'AVEJAN, bishop of Alais, having used black marble for paving the apartments of his palace, the friction and heat rendered it so fœtid that his successors were compelled to substitute another kind of stone in its place. The pavements of many churches and of the porticos of several galleries, on the continent of Europe, are formed of this marble; and many of the monuments of ancient Persepolis were executed with it. When strongly heated it becomes white, the bitumen to which it owes its colour being thereby dissipated.

The cutting and polishing of marble appear to have been performed by the ancients nearly in the same manner as with us. In polishing, the first substance employed is a sharp, coarse-grained sand. Afterwards a finer sand is used, then emery in different degrees of fineness. These are followed by a red powder called tripoli; and the last polish is given with putty.

Staining of Marble. The pieces to be coloured should be of the hardest kind; previously well polished; and be divested of every spot or blemish. Such only are calculated for supporting the heat which is always necessary, in order to open their pores, and render them susceptible of the colours. On the other hand, too low or too high a degree of heat are equally injurious: hence a due temperature ought to be preserved; and this, without making the marble red, will cause the liquor to boil on its surface. [About 150° Fahrenheit is sufficient.—T. C.]

The principal colours used for staining marble are *red*, *yellow* and *blue*: the two first of these tints may be imparted to it, by reducing dragon's blood, or gamboge, to a powder, and grinding them separately with spirit of wine in a glass mortar. But, in experiments on a small scale, a little of either of those powders should be mixed with spirit of wine in a silver spoon, and dissolved over a charcoal fire. Thus, a strong tincture will be extracted; with which, by the aid of a pencil, the finest traces may be drawn on marble, while cold: on heating the latter in an oven, the marks will penetrate deeply, and remain perfectly distinct.

A fine *blue* colour may be communicated to marble, by a watery solution of the drug, known among dyers by the name of *Canary Turnsol*, and tracing the marks designed with a pencil These will strike deeply into the stone, and the colour may be increased, by drawing the moistened pencil repeatedly over the same lines. The staining liquor must always be laid on cold; nor should the marble afterwards be heated; yet such blue is apt to spread itself irregularly, unless its outlines be circumscribed by wax, or other adhesive matter. This colour possesses the advantage of being applicable to marble that has already been stained with other drugs; it affords, besides, a very beautiful shade, and is not liable to be easily effaced.

In 1778, a patent was granted to Mr. RICHTER, for his invention of an art or method of inlaying *scagliola*, or plaster in marble or metals, so as to imitate flowers, fruits, trees, birds, beasts, landscapes, and every kind of ornament This patent is now expired; but, as it is practicable only by statuaries and artists, the inquisitive reader will consult the 10th volume of the *Repertory of Arts and Manufactures.*

[To clean marble, wash it first in an alkaline ley; then in soap and water, then in hot water.—T. C.]

MARBLING, the art of painting or disposing colours, in such a manner as to imitate marble.

There are several kinds of marbled paper, which vary only in the forms of figure of colouring: some are dotted; others drawn in irregular lines; but the method of tinging them, simply consists in stretching the paper on a thick solution of gum tragacanth, over which the colours are uniformly spread, after having been ground with ox-gall, and spirit of wine.

The paper must first be immersed in clear water, the sheets regularly folded over each other, and covered with a weight. It is now to be carefully laid on the colouring solution, and pressed softly with the hand, that it may bear equally on the whole. Next, it must be suspended in order to dry; and, as soon as the moisture is evaporated, the paper is polished by rubbing it with a little soap, and smoothing it either with glass highly burnished, or with a polished agate.

The colours usually employed for red, are, carmine, lake, or vermillion—for yellow, Dutch-pink and yellow ochre—for blue, Prussian-blue and verditer—for green, verdigris, a mixture of Dutch-pink, and Prussian-blue, in various proportions—for orange, the orange lake, or a composition of vermillion, or red-lead, with Dutch-pink—and, lastly, for purple, rose-pink and Prussian-blue.

These different colours are first to be finely triturated with spirit of wine, when a small proportion of gall is to be added, and the grinding of the whole repeated. The proper quantity of gall can be easily ascertained by comparative trials; because there must be only such a proportion of it used, as will suffer the spots of the various tinging matters to unite, when sprinkled on the solution of tragacanth, without intermixing, or running into each other. The whole being thus prepared, the solution is to be poured into different vessels, according to the colours employed, which are to be sprinkled on the surface; and the process of marbling is completed by laying the paper on the mixture, in the manner above directed.

MARCASITE, or **Pyrites**, is a mineral substance, formed by a combination of iron with sulphur.

It is usually of a bronze, yellow, or brownish colour, very various in form, being massive, globular, club-shaped, oval or crystallised; and so hard as to strike fire with flint.

Few minerals are more common than this, since it occurs, in some state or other, in almost every rock and vein. It is often found among coals; and, when heated, decrepitates with a loud unpleasant noise and sulphureous smell.

To the decomposition of this mineral it is that the hot temperature of almost all the mineral waters may be ascribed.

The name of pyrites, which in the Greek language signifies *fire-stone*, has been obtained by this mineral from its property of striking sparks from steel; and it was formerly used for fire arms as we now use flints. In commerce it is known by the name of marcasite. Some years ago, and particularly in France, it was much used in the making of buttons and buckles; and was cut and polished, by lapidaries, for trinkets, particularly for the rims and hands of watches, and various kinds of female ornaments. If skilfully cut in the form of small rose diamonds, although an opaque substance, it has somewhat the appearance of a diamond. In the tombs of the Peruvian princes, with whom a considerable portion of their valuables was always interred, there have been found polished plates of marcasite, which appear to have served them as mirrors.

MARCH, the third month of the year, according to the common way of computing. Among the Romans, March was the first month, and in some ecclesiastical computations, that order is still preserved, as particularly reckoning from the incarnation of our Saviour, that is, from the 25th of March. The ancients reckoned March and May as unpropitious to the rites of marriage.

MARE, the female of the horse kind.

Having already stated under the article Horse, the proper management of mares, considered as beasts of labour, we shall at present give a few hints relative to their treatment, during the period of foaling.

Mares bring forth after a gestation of about eleven months. Before they are covered, it will be advisable to keep them in the stable for five or six weeks, during which time they ought to be fed with good hay, and sweet oats well sifted: in order to promote the object, about a quart of blood may be taken from each side of the neck, five or six days previously to their admission.

No mare intended for the stud should be less than six years old: the most proper period for accomplishing the purpose, appears to be in the beginning of June, so that she may foal in the succeeding month of May; when the meadows will abound with rich grass, which contributes to the abundant secretion of milk; but Mr. Young (*Annals of Agriculture*, vol. 36.) thinks it is more advantageous when they foal early, for instance, in February; or, which is perhaps still better, in January; though he assigns no reason for such opinion.

MARE'S-TAIL, the Common, or *Hippuris vulgaris*, L. an indigenous perennial plant, growing in ditches and stagnant waters; it flowers in the month of May.

This weakly astringent vegetable is eaten by goats, but refused by cows, sheep, horses, and swine. Its rough stalks are employed by cabinet-makers and turners, for polishing wood, bones, brass, &c.

Marine Acid. See Spirit of Salt.

MARJORAM, or *Origanum*, L. a genus of perennial plants, comprising 14 species: of these, one only is indigenous, viz. the *vulgare*, Common, Wild, or Field Marjoram, which grows in thickets and hedges; it flowers in the months of July and August.

This plant delights in a calcareous soil, and is easily propagated either by its seed, or by slips of the roots. It is a fragrant aromatic, has a pungent, spicy taste, and is much esteemed for culinary purposes; especially for imparting a fine flavour to broths. The dried leaves are uncommonly grateful, and are sometimes used as a substitute for tea. An essential, but extremely acrid, oil is expressed from this herb, and which is often employed by farriers as a *caustic*. If a little cotton wool, moistened with such oil, be introduced into the hollow of an aching tooth, it frequently tends to relieve the pain. The whole plant, excepting the root, when boiled in water, imparts a bright red and deep brown colour to wool, especially if the latter be frequently taken out of the liquor, and properly beaten. But, if linen is to be dyed of a purple colour, it ought to be previously steeped in alum water, then immersed for 48 hours in a decoction made of the bark of the crab-tree. In Germany, the dried herb is occasionally suspended in a cask of beer. Goats and sheep eat its leaves and stalks; but they are not relished by horses; and totally refused by cows.

MARKET, a public place in a city or town, where live cattle, provisions, or other commodities are exposed to sale.

MARLE, a kind of argillo-calcareous earth, which is often and advantageously employed as a manure.

[It consists of common clay, with from one-quarter to one-third of calcareous earth, which can be dissolved out of it by dilute spirit of salt.—T.C.]

Marle is divided into three species; calcareous, argillaceous, and siliceous or sandy; all of which are composed of chalk and clay, so as to crumble with greater or less facility, on being exposed to the atmosphere. They are of a soft, unctuous nature, and dissolve speedily after rain: when dry, they slacken in the same manner as lime, and are at length converted into a very fine powder. Their quality varies according to the soil under which they are deposited.

1. *Calcareous Marle* is, in general, of a yellowish-white or yellowish-grey colour, but in some places of a brown or red cast. It is commonly discovered a few feet beneath the surface of the soil, and on the sides of hills, or on the banks of rivers flowing through calcareous countries. This species of marle is mostly of a loose texture; and, though sometimes moderately coherent, yet it seldom possesses a stony hardness, in which state it is called *stone-marle*. When it is mixed with shells, it is called *shell-marle*, and is reputed to be the best sort. It effervesces with acids: when pulverised, it feels dry between the fingers; and, if immersed in water, it readily crumbles to pieces, but does not form a viscid mass.

2. *Argillaceous marle* is of a grey, brown, or reddish-brown colour; being harder, and more unctuous, than the former species, and adhering to the tongue. It effervesces but does not moulder so quickly as the calcareous kind.

3. *Siliceous* or sandy *Marle*, contains a greater proportion of sand, than of chalk or clay. This species is of a brownish-grey or lead colour; it is, in general, friable and *flaky*, but sometimes forms very hard lumps. It effervesces with acids, but neither dissolves in water, nor moulders so speedily as either of the two former kinds. Marle affords an excellent manure for sandy, dry, gravelly, or light lands of any kind; it likewise produces very beneficial effects on mossy and clayey soils; provided a due proportion be applied, and afterwards perfectly dissolved.

The ingredient of marles, on which their fitnesss for agricultural purposes depends, is the *carbonate of lime*. It is owing to the presence of this earth, that marles effervesce on the addition of acids, which is one of their distinguishing characters. In ascertaining whether an effervescence takes place, let the marle be put into a glass partly filled with water, which will expel a portion of air contained mechanically in the marle, and thus obviate one source of fallacy. When the marle is thoroughly penetrated by the water, add a little muriatic acid, (spirit of salt.) If a discharge of air should ensue, the marley nature of the earth is sufficiently established.

To find the composition of a marle, pour a few ounces of diluted muriatic acid into a Florence flask; place them on a scale, and let them be balanced: then reduce a few ounces of dry marle into powder; and let this powder be carefully and gradually thrown into the flask, until after repeated additions, no further effervescence is perceived. Let the remainder of the powdered marle be weighed; by which, the quantity projected will be known. Let the balance be then restored. The difference of weight, between the quantity projected, and that requisite to restore the balance, will shew the weight of air lost during effervescence. [That air proceeds from the calcareous earth alone, which contains 44 per cent. of this carbonic acid air. Suppose 500 grains of marle lose 44 grains by the escape of air, then that marle contained 100 grains, or one-fifth of its whole weight of lime-stone.—T. C.] If the loss amount to 20 or 25 per cent. of the quantity of marle projected, the marle assayed is calcareous marle, or marle rich in calcareous earth. Clayey marles, or those in which the argillaceous ingredient prevails, lose only 8 or ten per cent. of their weight by this treatment; and sandy marles about the same proportion. The presence of much argillaceous earth may be judged by drying the marle, after being washed with spirit of salt, when it will harden and form a brick.

To determine, with still greater precision, the quantity of calcareous earth in marle, let the solution in muriatic acid be filtered and mixed with a solution of carbonate of pot-ash, till no further precipitation appear. Let the sediment subside; wash it well with water; lay it on a filter, previously weighed; and dry it. The weight of the dry mass will shew how much carbonate of lime, the quantity of marle, submitted to experiment, contained. See Kirwan on Manures.

The quantity necessary to be used, varies according to the nature of the soil; but the utmost caution is requisite; because, if too large a portion be scattered on the land, it cannot be easily removed; and, if too little be employed, the deficiency may be readily supplied. On sandy, gravelly, or light soils, it will be advisable to spread as much as will form a thick coat, in order to bind and stiffen the ground. But, of whatever nature the land may be, the most judicious cultivators recommend such a portion to be laid on it, as will form a thin coat over the whole surface.

The proper season for *marling*, is the summer; as this kind of manure is then perfectly dry, and not only lighter, but also more easily reduced to powder. Marle, however, may be advantageously spread during the winter-frosts; as in the latter season, there are few opportunities of performing other labours of the field.

Previously to marling, the land ought to be diligently cleared from all weeds, and rendered level, both with the brake and the common harrow, so that the marle may be equally spread on the surface; where it should be suffered to lie during the winter. In the month of February, and in dry weather, it will be proper to draw a bush-harrow, well weighted, over the land, that the marle may be uniformly distributed; but, as this manure is very ponderous, and sinks to the bottom of the furrow, if injudiciously ploughed in, it has been suggested to turn it into an *ebb-furrow* for the first crop: during the growth of the latter, the marle will incorporate with, and become a part of the soil, from which it does not readily separate. So permanent, indeed, are its fertilising properties, that if land be properly marled, it will continue arable for the space of 12 or 14 years; and, for pasture, during a much longer period.

A good *artificial marle* may be prepared, by mixing equal quantities of pure clay and lime, in alternate layers, so as to form a heap, which should be exposed to the winter frost: this compound is well calculated for light lands; but, if the soil be strong and heavy, it will be necessary to substitute loam and sand for the clay. Such compositions may be usefully employed, where marle is not easily procured; as they will amply repay the labour bestowed on mixing them, being little inferior to the genuine calcareous earth.

Marl-grass. See Clover, the Common.

MARRIAGE, a civil contract between

a man and a woman, by which they engage to cohabit exclusively with each other, with exclusive claim to the personal enjoyment of each other, during the remainder of their days.

Matrimony has been instituted among all enlightened nations, for the wisest of purposes; and, as the contract continues in force for life, such partner ought to be chosen with the utmost circumspection.

One of the most important points that merits constant attention, is the *healthiness* of the parties. Those who are the obvious victims of hereditary disease, ought, in conformity to every principle of justice and of reason, to be suspended from the connubial rites. Similar limitations should be observed with respect to the union of deformed persons, especially females, for whom a state of celibacy is doubtless more eligible; unless it appear, from proper inquiry, that notwithstanding their external deformity, they are fully competent to discharge the dignified maternal duties. Farther, an equality in point of natural disposition, temporal fortune, and of age, in both parties, should, as far as possible, regulate the choice. In the latter respect, the most proper period in general appears to be (in temperate climates) between the age of 18 and 20 in the female, and from 22 to 24 in the male sex.

[Throughout the United States, marriage is considered merely as a civil contract, as in Scotland; and satisfactory proof of the open and public avowal of the marriage contract between a man and woman capable to contract, with cohabitation accompanying it, will be regarded as proof of marriage.—T. C.]

Marriages one with another produce four children, rather more than four in the country, and less than that number in large towns. The durations of marriages have been estimated with great care, the result of which is given in the following table. Those whose ages together make

40 live together between 24 & 25 years
50 - - 22—23
60 - - 23—21
70 - - 19—20
80 - - 17—18
90 - - 14—15
100 - - 12—13

The duration of survivorship, or of widowhood, in the husband or wife, is equal to the duration of marriage, when the ages are equal, of course the number of survivors, or of widows and widowers, (supposing no second marriages), alive together, will be equal to the whole number of marriages.

MARROW, in animal economy, an oily matter secreted by the arteries of the internal membrane, which covers the bones. Its particular use, to the living body, has not hitherto been clearly ascertained; though it is probably of the same service to the bones, as fat is to the soft parts; namely, to render their fibres less brittle, by its lubricating property.

MARS, in astronomy, the planet that revolves next beyond the earth in our system, is of a fiery or reddish colour: He is not subject to the same limitation in his motions as Mercury and Venus, but appears sometimes near the sun, and at others at a great distance from him, sometimes rising when the sun sets, or setting when he rises. Mars appears to move from west to east round the earth, his periodical motion round the sun is in 687 days nearly. His apparent motion is very unequal, and he moves about his axis in little more than one of our days and nights. See SOLAR System.

MARSH, signifies a tract of ground partly covered with water, yet so as to permit grass or other vegetables to rise above its surface: these, while gradually decaying, occasion putrid exhalations, which are extremely pernicious to the health of mankind.

Marsh-lands are chiefly employed for the grazing of cattle, which, in such pastures, fatten speedily; nay, it is by some writers, though we believe erroneously, asserted, that sheep feeding on them, are preserved from the rot. Without attempting to decide this question, we shall observe, that it will be advisable to raise a bank, and plant it with trees, if possible, in the midst of the marsh, either crosswise, or in a semicircle: they would afford a shelter for the cattle, and in a few years repay the expense of forming the plantation. If the soil be situated near the sea, it will also be requisite to form ponds or reservoirs for the reception of the rain, in order that the sheep, &c. may at all times be furnished with sweet water. Such fence or trees will, at the same time, serve to intercept the sea-breezes, which often *nip* the tops of the grass, if unsheltered from their influence.

In order to convert a marsh into firm or arable land, it should first be drained, in the manner described in article DRAIN. Its various parts ought next to be wholly changed: 1. By frequent ploughing, harrowing, and burning; 2. By the addition of marle, clay, gravel, or other heavy substances; 3. By such matters as act chemically upon the soil, and bring its latent principles into action; for instance, lime, chalk, alkaline salts, &c.; 4. By spreading those manures which have a large proportion of fat, or mucilage; such as putrid fish, sea-weed, stable-dung, &c.; because marsh-lands rarely contain any animal substances, which are, in a great measure, the chief constituent parts of a rich soil. Lastly, by compression, either by the treading of cattle, or by the use of rolling-carts, and similar heavy implements.

Where marshy situations are too extensive to render them completely dry, they ought to be constantly flooded, by means of dams and sluices, to prevent the effects of putrefaction. Lastly, to obviate still farther the pernicious consequences of residing near marshes or mill-ponds, it will be useful to plant between those waters and the dwelling-house, rows of such trees as vegetate rapidly, and retain their verdure to a late period of the year, so that the humid vapours may be intercepted, while such vegetables furnish a constant supply of oxygen to the atmosphere.

MARSH-LOCKS, the Purple, or Marsh Cinquefoil, *Comarum palustre*, L. an indigenous perennial plant, growing in muddy and putrid marshes; flowering in the months of June or July; and producing red berries in autumn. The whole plant may be usefully employed in tanning calf-skins. The Irish, who dispose of milk in the streets, rub the inside of their pails with this herb; in consequence of which the milk appears to be thicker and richer. The roots of the marsh-locks produce in dyeing an indifferent red colour. Goats eat the plant, but it is not relished by either cows or sheep, and totally refused by horses and hogs.

MARSH-MALLOW, or *Althæa officinalis*, L. a perennial plant, growing in salt marshes and on the banks of rivers; flowering in the month of August.

Every part of the Marsh-mallow, and especially the root, on boiling it, yields a copious mucilage; on account of which, it is frequently employed in emollient cataplasms, and by way of infusion.

It is with equal advantage applied externally, for softening and maturating hard tumours; and when chewed, it is said to afford relief in difficult teething. The *Syrup of Marsh mallows*, sold in the shops, is prepared from the roots, and chiefly used for sweetening emollient decoctions.

MARSH-MARYGOLD, or Meadow-Bouts; *Caltha palustris*, L. an indigenous perennial plant, thriving in moist meadows, and on the banks of rivers: it flowers in the months of April and May.

This hardy vegetable preserves its verdure during the winter: hence, its cultivation has been recommended by Duhamel, as an excellent winter pasture for cattle. It may be easily propagated either by parting the roots in autumn, or by sowing its seeds about the latter end of the summer: it requires a humid soil, and a shady situation. When gathered before they expand, the flowers, if preserved in vinegar with the addition of salt, may be used as a substitute for capers. The juice of the petals, boiled with a little alum, communicates to paper a yellow colour; and it may likewise be employed in the spring, for imparting a similar tinge to butter. Although Boerhaave informs us that cows will not touch this plant, unless impelled by hunger, when it produces a fatal inflammation; yet we believe with Duhamel and Bechstein, that cattle may eat it with safety; as they instinctively devour its bitter leaves. Goats and sheep also relish the Marsh-marygold; but horses and swine refuse it.

MARTIN, or *Hirundo urbica*, L. a well known bird of passage, which makes its annual appearance in Britain, from the beginning of April to the middle of May, according to the state of the weather.—See Swallow.

Martin (*Mustela foina*) is a quadruped belonging to the weasel tribe, with greatly lengthened body and short legs, and the body of blackish tawny colour above, brown on the belly, and white on the throat.

This animal is about eighteen inches in length, exclusive of the tail, and is not uncommon in woods near farm yards, in the southern districts of Great Britain and Ireland. It is also found in several parts both of the old and new continents.

In some countries the martin is an object of eager pursuit, on account of its *skin*, which makes a valuable fur. This is in great request in Europe for lining and trimming the robes of magistrates, and for several other purposes. In Turkey, where furs of all kinds are in much esteem, those of the martin are particularly admired; and they are exported thither chiefly from

France and Sicily. They form a considerable article of commerce betwixt Great Britain and the northern parts of America; above 12,000 being annually imported from Hudson's Bay, and more than 30,000 from Canada. The most valuable part is that which extends along the middle of the back. In England these skins are sold for about seven shillings each; and the best and darkest of them are sometimes imposed upon the purchaser for sables' skins. In some countries the *flesh* of the martin is eaten; but from its musky flavour it is not very palatable even to persons who are accustomed to partake of it.

This active little animal, which feeds upon birds and small animals of various kinds, climbs with the utmost agility into trees, and even up the sides of walls, in pursuit of its prey. It often enters pigeon and poultry houses, where it destroys, in abundance, eggs, pigeons, and fowls, issuing from its retreat, for this purpose, in the dusk of the evening. Both in its general appearance and in its actions the martin is a peculiarly elegant and graceful animal.

Martins are tamed with great difficulty, never forming any attachment, so that they must always be chained. Nevertheless, if properly secured, they are very useful in farm-yards, for destroying rats, mice, &c.

We are not acquainted with a better method of exterminating these depredators, than by smothering them in their recesses with the smoke of sulphur.

MARYGOLD, the Trifid Bur, Trifid Double-tooth, Water-hemp, or Hemp-agrimony; *Bidens tripartita*, L. an indigenous annual plant, growing in marshy and watery places, and flowering in the months of August and September. Dambourney and other writers inform us, that both the fresh and dried herb imparts to wool, with the addition of alum, a very bright yellow colour: the yarn or cloth, however, should be washed and dried before it is immersed in the dyeing liquor, in which it ought to be boiled for two hours; and, in order to extract more effectually the colouring particles, the plant must be cut in small pieces, put in the vessel, in alternate layers with the substances to be tinged, and properly agitated.

There is another species, namely, the *Bidens cernua*, or Nodding Marygold, which is possessed of similar properties.

Marygold the Corn. See Great White Ox-eye.

MASAGAN BEAN, was noticed under the article Bean. The following directions to raise them early in summer, are given by Richard Weston of Leicester. See *Rep. Arts*, *new series*, vol. i.

Plant Masagan beans in October, on a south border, close to the wall, three inches asunder, in two or three rows. In frosty weather, cover them with long litter. Transplant them at spring, leaving the strongest at five or six inches distance.

MASH, a drink given to horses. It is prepared by infusing half a peck of ground malt in a sufficient quantity of boiling water, then agitating the liquor, till it acquires a sweet taste, and when lukewarm, administering it to the animal.

This preparation is used generally after a purge, in order to promote its operation; and, after hard work; or, as a substitute for drink, when a horse labours under depressing sickness.

MASSICOT is the yellow oxyde of lead, containing less oxygen than red lead.

MASTIC is a resinous substance, obtained from a low tree or shrub (*Pistacia lentiscus*) which grows in the Levant.

It has alternate winged leaves, consisting of several pairs of spear-shaped leaflets, and spikes of very small flowers, which issue from the junction of the leaves with the branches.

The mode in which this resin is obtained is by making incisions across the tree in different parts, from which the juice exudes in drops, that are suffered to run upon the ground, and there remain until they are sufficiently hardened to be collected for use. The season for this process commences in the dry weather of the beginning of August, and lasts until the end of September. The best mastic is that imported from the island of Scio. We receive it in semi-transparent grains, of yellowish colour. These emit an agreeable smell when heated; and, when chewed, first crumble, and afterward stick together, and become soft and white like wax.

With the Turkish woman it is customary to chew this resin to render their breath more agreeable, and under a notion also that it tends to make their teeth white, and to stengthen the gums. They also mix it in fragrant waters, and burn it with other odoriferous substances, by way of perfume. It was formerly much used in medicine, as a remedy against pain in the teeth and gums; and dissolved in spirit of wine, is a relief in obstinate and long continued coughs: but it is now almost wholly disused for these purposes; and is chiefly employed in the composition of varnish, and by surgeons for filling up the cavities of decayed teeth.

The *wood* of the mastic-tree is imported in thick knotty pieces, covered externally with an ash-coloured bark. This wood is accounted a mild, balsamic, astringent; and a preparation of it, under the name of *aurum potabile*, is strongly recommended by some of the German writers, in coughs, nausea, and weakness of the stomach.

[Mastic grows in Chio. It is soluble in spirit of wine and in oil of turpentine, and then forms the various varnishes of mastic.—T. C.]

MASTIFF, *Canis villaticus, v. catenarius*, L. a valuable species of the dog-kind.

This bold animal is alike remarkable for his loud voice in barking, his extraordinary size, and surprising strength. So great indeed is their courage and muscular power, that three of these quadrupeds are more than adequate to cope with a lion.

The mastiff is particularly valuable as a vigilant house-dog, and it is much to be regretted, that this species of useful creatures has, within a few years, rapidly declined in numbers. For the most proper method of managing dogs, in general, the reader is referred to that article.

MATCHING, a method of preparing vessels for the preservation of wines, cyder, or similar liquors, from becoming sour. It is effected in the following manner: Let any quantity of sulphur be melted in an iron ladle; and, as soon as it is liquefied, slips of coarse linen cloth are to be dipped in it; which, when taken out and cooled, are called *matches*. One of these slips is now to be lighted, and suspended in the bung-hole of a cask, which ought to be slightly stopped, till the *match* is consumed; when the hole may be closed, and the vessel be suffered to stand for one or two hours. On opening the bung-hole, it will be found that the sulphur has communicated to the whole cask a very pungent, though suffocating and acid, odour.

The vessel may next be filled with small wine, newly fermented; and, on carefully closing it, the liquor will speedily clarify. This method is very commonly practised in different parts of England, and is said to be very useful; as many poor wines may thus be preserved potable for a considerable time. We doubt, however, its salubrity; and conceive that other articles might be advantageously employed instead of the pernicious fumes of sulphur, which render both wine and cyder alike unwholesome, especially for persons affected with diseases of the breast or lungs.

MATWEED, the Sea, Helme, Sea-reed, or Marram, *Arundo arenaria*, L. an indigenous perennial plant, growing only on the driest sandy shores, and flowering in the month of June or July. This useful reed prevents the wind from dispersing the sand over the contiguous fields, which, by neglecting its propagation by seed, are not unfrequently rendered useless. The Dutch have availed themselves of this advantage; and, for the same reason, Queen Elizabeth wisely prohibited the extirpation of this beneficial vegetable. It is at present cultivated on the Norfolk coast, with a view to prevent the irruption of the sea: the inhabitants of Newborough, in the Isle of Anglesea, manufacture it into mats and ropes, whence they obtain their chief support.—In Denmark, the fibrous roots of the Sea Matweed are employed for making whisk-brushes; and the Icelanders collect and dry the seeds; from which, after reducing them to powder, a palatable bread is prepared, resembling in taste the meal of malt.

MATWEED, the Small, Heath-matweed, or Mat-grass, *Nardus Stricta*, L. an indigenous perennial plant, growing on moist heaths and marshes; flowering from June to August. It is eaten by horses and goats, but disliked by cows and sheep.

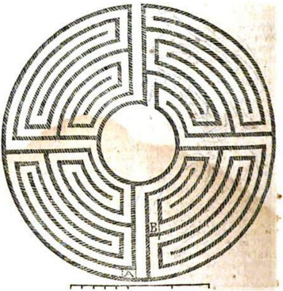
This species is often a troublesome weed, as well on arable lands as on pastures, where it affords but coarse food to cattle: as it, however, forms large and thick tufts, which resist the action of the scythe, it may be usefully transplanted to loose sandy lands: in such situations, its spreading horizontal roots greatly tend to consolidate the soil, and increase the stratum of vegetable mould, for the reception of more useful plants. Bechstein remarks, that it would be advisable to propagate the Small Matweed in young plantations exposed to cold and bleak winds; on account of the protection it might afford to tender trees.

MAY, the fifth month in the year, reckoning from January; and the third, counting the year to begin with March. This month derives its name from Maia, the mother of Mercury, to whom they offered sacrifice on the first day of it: hence May-day garland. The month of May has been esteemed favourable to love, but inauspicious to marriage. See MARCH.

MAY-WEED. See Fetid CHAMOMILE.

MAZE, or LABYRINTH, in gardening, denotes a piece of ground, planted and arranged in various meanders, so as to render it difficult, after entering the walks, to find the leading avenue.

Labyrinths contribute equally to health and amusement; and, as few persons possess gardens or pleasure-grounds sufficiently extensive for long-walks, we have subjoined an outline of a maze, in which simplicity and economy are strictly combined.



The principal expense of such a maze, will be the green hedges, which ought to be seven feet high; and, if the breadth of the walks be calculated at four feet, besides 12 inches for the room occupied by the shrubs, the diameter of the whole will not exceed 150 feet. In the centre might be planted a lofty chesnut or other tree, with spreading branches: or a circle of poplar-trees, the height and sprightliness of which invite the wanderer to refresh himself under their cooling shade.

It should be remarked, that the plan, as appears from the preceding cut, represents only regular intertwined walks which, by various circumvolutions, lead exactly to the central spot of ground. But, if it be designed to establish a real *labyrinth*, on a larger scale, the hedges ought in various directions to be interrupted; for instance, at the points marked with the letters A, and B, in order that those who mistake the true path, might inadvertently return to the avenue whence they came.

Lastly, a maze should, if possible, be so situated, that it may be viewed from the windows of a house, or an elevated spot, in its vicinity. Thus, it will afford an interesting spectacle to persons of the most opposite disposition of mind; the gay and cheerful will delight in beholding others perplexed in the pursuit of the central spot: while the grave and reflecting have an opportunity of viewing, as in a mirror, a picture of active life, where man often seems to deviate from the true path, which nevertheless conducts him the nearest way to the end of his journey: while others, though sometimes very nigh the desired object, in a manner blindfold pass by, and with every step advance on the contrary road!

MAZZARDS. See Common Wild CHERRY-TREE.

MEAD, an agreeable liquor prepared of honey and water, with the addition of spices.

Various methods are practised in the brewing of mead; which, however, do not essentially differ from each other: he following is one of the most approved:—Let the whites of six eggs be well incorporated with twelve gallons of water, to which twenty pounds of honey are to be added. The ingredients should boil for the space of one hour; when a little ginger, cloves, cinnamon, and mace, together with a small sprig of rosemary, are to be put into he liquor. As soon as it is cool, a spoonful of yeast ought to be added, and the mead poured into a vessel which should be filled up, while it *works.* When the fermentation ceases, the cask ought to be closed, and deposited for the space of six or eight months n a vault or cellar, of an equal temperature, and in which the liquor is not liable to be affected by the changes of the weather. At the end of that period, it may be bottled, and is then fit for use.

A more simple, and, to some palates, more agreeable method is, to mix the honey in the proportion of one pound to a quart of water, which is to be boiled, scummed, and fermented in the usual manner, without the addition of any aromatic substances. It ought to be preserved in a similar manner, and bottled at the expiration of the same period of time.

The following recipe is recommended by the same correspondent who furnished that for the currant wine.

To 30 gallons of water, add 90 pounds of pure honey, boil and skim, put the liquor into a large open tub, and add two ounces of bruised ginger-root, half an ounce of cinnamon, the same quantity of pimento; let the whole stand until of a proper temperature, then add yeast as in *currant wine*, flavour and barrel it up for use.

Mead was formerly the favourite liquor of the ancient Britons, and Anglo-Saxons. It still retains its place at country feasts in the western parts of Britain; where considerable quantities are brewed annually. Being an wholesome and pleasant beverage, it is far preferable to brandy, gin, or other pernicious spirits; though it does not always agree with the bilious, asthmatic, or those whose breast and lungs are in the least affected. But if it be kept for a number of years in proper vessels, and dry cellars, it acquires a flavour and strength equal to the best Madeira or even Tokay wines: in this state, mead is a true medicine to the aged and infirm, when used with moderation.

MEADOW, generally signifies pasture, or grass land, that is annually mown for hay: but it more particularly denotes such tracts of ground as are too low, and too moist for cattle to graze on them during the winter, without injuring the sward.

The best lands for meadow are those situated on a gentle declivity, so as to be irrigated at pleasure, and which at the same time possess a rich soil and moist bottom, especially if it be in the vicinity of a brook, or small running stream. See IRRIGATION.

Great Britain and Ireland are reputed to possess the most verdant pastures, and the finest natural grasses, in the vegetable creation: these advantages, however, do not appear to meet with that attention which they deserve. Lately, indeed, the cultivation of grasses has been a favourite pursuit among experimental farmers and freeholders; but, as the tenantry, in general, are bound to follow a certain rotation of crops, without having the power of breaking up old and unproductive meadows, *extensive* improvements cannot be expected, while such limitations prevail. We have cursorily mentioned these obstacles to national prosperity; because they would require a more ample investigation than is compatible with our limits.

The first requisite towards obtaining a good meadow is, a perfect acquaintance with the best natural grasses, their peculiar soils, and the best mode of collecting their seeds: the most valuable are those of the northern and eastern parts of England. But, as comparatively few have an opportunity of procuring such seeds, the only method that can be pursued with hopes of success, appears to be that of selecting those grasses, which thrive luxuriantly on a similar soil; and to gather the ripe seed from a productive old meadow.

On lands intended for pasture, and especially for sheep, it is advisable to sow *three* kinds of vegetables, with a view to gain the advantage of successive growth. Thus, Mr. PARKINSON sows four bushels of the seed of ray-grass, or red darnel (*Lolium perenne*, L.); 10 lbs. of trefoil seed (more properly common clover, *Trifolium pratense*, L.); and a similar quantity of white clover (*T. repens*, L.) He is of opinion that the ray-grass should be grazed early, while the white clover is still concealed in the ground, and the trefoil, or common clover, is just appearing; that, when the darnel is eaten down, the common clover will spring up, and afford excellent food for sheep; after which the white clover will appear: and, when the latter is consumed, the ray-grass again grows, and supplies pasturage during the winter months, if the weather prove tolerably mild. Hence this truly "experienced farmer" maintains, that one-third more in number of sheep, at least, may be thus supported than by any other method.

In order to form a meadow, far superior to the generality of artificial pastures, Mr. Curtis recommends six kinds of grass, and two of clover, to be sown broad cast. The seeds are to be mixed together in the following proportions, viz.

Meadow Fescue-grass:	*Festuca pratensis,*	4 parts
Meadow Fox-tail grass:	*Alopecurus pratensis,*	4
Smooth Stalked Meadow-grass:	*Poa pratensis,*	2
Roughish Meadow-grass:	*Poa trivialis,*	2
Crested Dog's-tail grass:	*Cynosurus cristatus,*	1
Sweet-Scented Spring-grass:	*Anthoxanthum odoratum,*	1
White or Dutch Clover:	*Trifolium repens,*	2
Common or Red Clover:	*Trifolium pretense,*	2

These are to be mixed together, and about three bushels of them sown on an acre, in rows, so that they may be more conveniently hoed; in consequence of which they will vegetate with greater luxuriance. Towards the end of August, or early in September, it will be necessary to weed and *thin* the grasses occasionally, and also to roll them in the spring; an operation by which such roots as may have been raised by the frost, will be pressed into the ground. Mr. Curtis is farther of opinion, that the meadow fox-tail, and roughish meadow-grasses, are best adapted to moist soils; the smooth-stalked meadow and crested dog's-tail, to dry pastures; and lastly, that the meadow-fescue and sweet-scented spring-grasses will suit land, which is either moist or moderately dry.

If the soil be previously cleared from all noxious weeds and plants, the above specified combination of grasses will, in the course of two years, form a most excellent meadow. But, in case it be required to *seed* a piece of land immediately, and the valuable grasses before mentioned cannot be procured, it has been recommended ("*New Farmer's Calendar*," 1801) to sow the following seeds, which are easily attainable; viz. Broad clover (a variety of the common clover) or cow-grass; white clover, trefoil, ray-grass, and, if the soil be sufficiently dry, burnet. On clean tilth, they will, in a few years, present a good meadow; as the clover and ray-grass, in the first or second year, produce an ample swathe for mowing: next, they will be succeeded by a luxuriant crop of the white clover and trefoil, united with the natural grasses of the soil.

Grass-seeds ought to be sown during moist weather, either in the summer or in autumn, after turnips, cabbages, or any other hoeing crop: for it is absolutely necessary to prepare for them a fine and clean tilth. On the approach of winter, the young crop should be slightly covered with long stable-dung, old thatch, or even sand, earth, or any other manure. The land ought, likewise, to be occasionally cleared of the weeds, together with their roots, and the vacant spots fresh *seeded.*

In laying lands down for meadows, old turf must be uniformly broken up, by paring and burning, when it is to be sown with new grasses; but, such soils as have been completely exhausted by successive crops of corn, should first be laid dry and diligently cleaned: then sown with proper herbage, *up-dressed,* and manured for the space of two or three years; in consequence of which they will recover their former fertility.

Lastly, the operation of rolling meadows in the spring, especially such as have been irrigated, ought never to be omitted. The most proper time for this purpose is the beginning or middle of February, after the land has been laid dry for a week. Rolling prepares the grass for being cut close to the surface, when mown: which is a circumstance of considerable importance; because the ant-hills, and other little elevations, are thus pressed closely to the ground, and many inconveniences will be thereby effectually removed.

MEADOW-GRASS, or *Poa*, L. a genus of plants, comprising 53 species, 16 of which are natives of Britain: the principal of these are:

1. The *aquatica*, or Reed Meadow-grass, growing in marshes and on the

banks of rivers, flowering in the months of July and August.—This species is uncommonly valuable for being propagated on the banks of rivers or brooks, where it is devoured with great avidity by horses, cows, and sheep: but, as it is apt to *blow* or distend the bowels of cattle, when eaten too largely, or when its panicles are burnt, these circumstances deserve some attention. It abounds particularly in the Isle of Ely, rising to the height of six feet, though usually mown when about four feet high: after being dried, it is bound up in sheaves, then formed into *ricks*, in which it undergoes a slight degree of fermentation, to improve its sweetness for provender. In this state, it is provincially called *White-lead*, from its acquiring a white surface when dry: it is peculiarly useful for milch cows; but horses do not relish it, when thus prepared.—The reed meadow-grass is one of those vegetables that deserves to be more generally known and cultivated; as it likewise affords, if properly dried, an excellent substitute for straw, in thatching.

2. The *pratensis*, or Smooth-stalked Meadow-grass, which grows on dry banks, and even on walls: it flowers in the months of May and June. This plant thrives better in dry than in moist situations, whence it retains its verdure during hot and dry seasons, longer than any other vegetable. Its root spreads along the ground almost as rapidly as the couch-grass, and is nearly as difficult to eradicate: it ought, therefore, to be introduced with great caution, where the pasturage is not intended to be permanent.—Though eagerly eaten by cattle, and esteemed to be one of the best grasses for hay, its value decreases, as its quantity every year diminishes in dry soils; and it at length produces very indifferent crops. This diminution is occasioned by its roots *matting* together, and exhausting the land; which effects, however, may be prevented by manuring the soil, and are not so perceptible on moist grounds, where the plant will flourish, though not so luxuriantly as in dry situations.

3. The *annua*, Annual Meadow-grass, or Suffolk-grass, which grows on pastures, in paths, gravel-walks, and the borders of fields; it flowers during the whole summer.—This grass is devoured with avidity by every kind of cattle; and as it abounds in the county of Suffolk, where the finest salt-butter is prepared, Mr. Stillingfleet conceives it to be the best grass for milch-cows.

4. The *trivialis*, Roughish Meadow-grass; Bird grass; Fowl-grass; or Fold-meadow grass. It is perennial, grows on moors, moist pastures, and the sides of hedges; and flowers from June to September. This plant is reputed to be in every respect the first of British grasses; as the best meadows abound with it, and particularly the celebrated *Orcheston Meadow*, in the county of Wilts. And though few grasses are more productive, or better calculated for hay or pasturage, than the rough meadow-grass, yet it requires a moist soil, and a situation somewhat sheltered, being liable to be injured by severe cold or excessive drought. It is much relished by every kind of cattle.

5. The *compressa*, Flat-stalked, or Creeping Meadow-grass: It is perennial; grows on walls, house-tops, and very dry situations, and flowers from June to August. This species, in the opinion of Dr. Anderson, is the most valuable of the meadow-grasses. Its leaves are firm and succulent; of a dark Saxon-green colour; and grow so closely together, as to form a pile of the richest pasture-grass. Its flower-stalks continue to vegetate very luxuriantly during the summer; and, even in a fading state, the leaves retain their beautiful green cast. The latter are much larger, and more abundant than those of the roughish meadow-grass. Besides, it produces a fine turf in parks and sheep-walks, while it renders the flesh of deer and sheep, uncommonly tender and sweet flavoured; being a favourite food of these animals.

6. The *palustris*, or Marsh Meadow-grass, which abounds in marshes and overflowed lands. It grows to the height of four or five feet; is excellently calculated for laying down spongy or fenny grounds; and is reputed to be equal, if not superior, to any other vegetable for the purposes of the dairy. In autumn, however, its leaves become somewhat prickly.

7. The *maritima*, or Sea-Meadow-grass, which is frequent on the sea coast, and flowers in the months of June and July. It is one of the principal grasses which grow in salt marshes, and is eagerly eaten by cattle.

Poa viridis, Green-grass, Spire-grass, or Spear-grass, was described under article Grass.

MEADOW-SAFFRON, or Tuberoot, *Colchicum autumnale*, L. an indigenous perennial plant, being the principal of three species; growing in meadows; flowering in the months of August and September.

The flower of this hardy plant rises immediately from the root, and its large leaves appear in the succeeding spring: the former afford a beautiful variety of purple, white, red, rose-coloured, yellow, &c. with single and double flowers. This vegetable is more ornamental than useful; and, though it frequently occupies a considerable part of a meadow, it is never touched by horses.

In its medicinal properties, the Meadow-Saffron resembles those of the Squill: the root of the former has ever been considered as an acrid poison, but it is less injurious in autumn than in the spring; its seed is also deleterious, though not mortal to either man or cattle. The juice expressed from the leaves of this plant, when rubbed on the skin of animals, affords a very powerful and effectual remedy against vermin, with which they are often infested.

[The Meadow-Saffron has lately been deemed a specific for the gout, and the principal ingredient in HUSSON'S Gout Drop. But this is not certain. The recipe is: take 4 oz. of the root of the meadow-saffron, and digest them in half a pint of Lisbon or Teneriffe wine for three days, keeping the mixture in a warm situation. Then filter the liquor, and let it subside for a week. Pour it off clear from the sediment, and take from 80 to 100 drops on going to bed. It operates gently as a cathartic and diuretic. In my opinion all these gout medicines are unsafe palliatives, that ultimately strengthen the disease. If the gout is intolerably painful, take of laudanum 100 drops in a large table spoonful of volatile tincture of guaiacum: but the best of all remedies is patience and moderate diet.—T. C.]

MEADOW-SWEET, the COMMON, or QUEEN-OF-THE-MEADOWS, *Spiræa ulmaria*, L. an indigenous perennial plant, growing in moist meadows and on the banks of rivers; flowering in the months of June and July. Its stalk attains the height of four feet; and the fragrant flowers, when infused in boiling water, impart to it a very agreeable odour, which arises on distillation: hence they are often employed by wine-merchants, for improving the flavour of *made* wines. The roots are so powerfully astringent, that calf-leather has been tanned with them in a fortnight. According to BRYANT, the Russians prepare of these roots a palatable granulated four or *groats;* and OLAFFEN informs us, that the Icelanders dye a durable black colour, by a decoction of the whole plant. Hogs devour the roots with avidity; goats and sheep also relish this herb, but cows and horses refuse it.

MEALY-TREE. See GUELDER-ROSE.

MEASLES, or *Rubeola*, a contagious disease, accompanied with inflammatory fever, sneezing, defluxion of a thin humour from the eyes, and a dry hoarse cough. On the fourth day, or sometimes later, small clustered pimples break out on the skin, but which generally disappear in three or four days, leaving behind branny or mealy scales.

The measles bear great resemblance to the small-pox; and likewise affect a person once only during his life. They are most frequent among children in the spring, but, if properly managed, seldom prove fatal.

The disease commences with a fit of shivering, succeeded by intense heat, thirst, anxiety, sickness, and vomiting, which vary in different constitutions. The eye-lids are swelled; the eyes partially inflamed, and weeping; a constant drowsiness prevails; and, on the fourth day, the pustules appear first on the face, and gradually spread over the whole body. The vomiting ceases, but the fever, cough, and difficulty of breathing, are increased. In the course of three or four days the pimples assume a pale colour, and by the ninth or tenth, are not to be perceived. But, the fever, and other symptoms, will not abate so early, if the patient be not sufficiently cool: they are sometimes succeeded by an alarming and dangerous looseness, which may terminate in death, unless the strictest attention be paid to the whole state of the *disorder.*

Cure: As the measles are of an inflammatory nature, it will, in some instances, be necessary first *to bleed* the patient, especially if the fever be violent; though that operation is, in general, neither necessary nor *advisable.*

In mild cases, it will be sufficient to keep the patient's body open, by means of tamarinds, manna, or other gentle laxatives; and to supply him frequently with barley-water, linseed-tea sweetened with honey, or other cooling and mucilaginous drinks. Considerable benefit will result from bathing the feet in warm water; and, if there be a disposition to vomit, it ought to be promoted by the liberal use of lukewarm water, or chamomile tea. The dry ough will be greatly relieved by gen-le opiates, if used with due precaution, n preference to the oily or demulcent draughts given on such occasions

The most fatal period of the measles, however, is at the *crisis*, or turn: should the fever then become violent, and the patient be in danger of suffocation, relief may be obtained by repeated venesection and blisters. If, nevertheless, the disorder appear to affect the interior organs, or *strike inward*, the imminent danger may sometimes be averted, by applying blisters both to the arms and legs, and briskly rubbing the whole body with warm flannels.

The patient's regimen, throughout this disorder, ought to be strictly *cooling*. His food should be light, and the drink may consist of barley-water, balm-tea, infusions of linseed, or other diluent liquids, sweetened with a little honey. When the malignity of the disorder is subdued, it will be advisable to administer a few gentle laxatives; and, if it be attended with a debilitating diarrhœa, this may be mitigated by taking a few grains of rhubarb every morning, and gentle opiates every night. The diet should uniformly be light, though nourishing; and the patient will also derive great benefit from frequent exercise in the country air.

After the measles, the body is left in a disposition to be affected by cold, more sensibly than after most complaints. After an attack, therefore, of this disease, the greatest care should be taken to keep the body warm, and to expose it to the air by degrees.

MEASURE, in a legal and commercial sense, denotes a certain proportion or quantity of any commodity, whether dry or liquid, that is bought, sold, valued, &c.

Measures vary according to the different kinds and dimensions of the respective articles. Hence they are, in general, either longitudinal, which relates to lengths; or cubical, that is, solid measures, for bodies and their capacities. Of both we shall give a concise account; as our work would otherwise be incomplete.

I. Long-Measure.

The smallest nominal part of the English long measure, is an *inch*, which is composed of three barley-corns, being the largest and finest that can be selected from the ear. Three inches form a palm; an equal number of palms make a span; 1 1-3 span, a foot; 1 1-3 foot a cubit; 2 cubits a yard; 1 2-3 of a yard make a pace (consisting of *two* steps;) 1 4-5 of a pace, a fathom; 2 3-4 fathoms form a pole; 40 poles, a furlong; and 8 furlongs are computed to a mile.

II. *Measure of capacity for dry articles.*

1. For Corn. The standard measure for salt, all kinds of grain, and other dry commodities, is the Winchester gallon, which contains eight pints, or 272½ cubic inches; and is by law 18½ inches in diameter by 8 inches deep. 2 gallons make a peck; 4 pecks a bushel; and 8 bushels a quarter. Four quarters of corn are computed to a chaldron; five quarters to a *wey* (weigh) or load; and ten quarters to a ton.

2. For Coal. In measuring sea-coal, five pecks make a bushel; 9 bushels, a quarter; 4 quarters, a chaldron; and 21 chaldrons are computed to a score.

III. *Liquid Measure.*

The English liquid measures were originally established on the basis of Troy-weight: it having been enacted by several statutes, that eight pounds troy of wheat (the grains of which have been selected from the middle of the ear, and well dried) should weigh a gallon of *wine measure;* and that the divisions and subdivisions of the latter should form the decreasing smaller proportions. It was farther provided, that one liquid measure was to be uniformly adopted throughout the kingdom. Custom, however, has prevailed, and a new weight, namely, Avoirdupois, (which see) was introduced; so that a second standard gallon has been adjusted to the old one, which it exceeds in the same proportion as the avoirdupois does the troy weight. From this standard, two different measures are regulated for *ale* and *beer*, which we have already stated under the articles Firkin, Barrel, Hogshead, &c. The old standard measure (being kept under seal at the Guildhall, London) is employed for wine, spirits, &c. and contains the following subdivisions: 28 7-8 solid inches form one pint, (wine measure);—8 pints make a gallon;—18 gallons a rundlet;—1¾ rundlets, a barrel;—1 1-3 barrels, a tierce;—1½ tierces, a hogshead;—1 1-3 hogsheads, a puncheon; 1½ puncheons, a butt or pipe; and 2 pipes a tun.

These are the chief measures at present employed; a knowledge of which is very useful, and necessary to prevent imposition. For this purpose, standard measures are kept in various parts of England, in conformity to which all others are directed to be made; so that, if any one be accidentally lost, it may be easily restored; or corrected, if it be inaccurate. See MENSURATION.

MEAT, a general appellation for the flesh of animals when preserved for food. [Fresh meat can be prepared either in molasses, in charcoal dust, or in carbonic acid gas.—T. C.]

Uses of Charcoal, as applied to the preservation of animal food.

When fresh meat in summer time is apt to become tainted, the common practice (not a bad one) is to wipe it, to wrap it up in a cloth and bury it for some hours about a foot under ground. It is usually improved by this process. Another method is, to put some salt in water, and when it fully boils, dip the suspected meat in it, and let it boil for about five minutes. This has the following effects: it kills the eggs of the places where it may be fly-blown: it fully destroys any remaining muscular irritability at the surface, which renders the meat more liable to putrefy: it hardens the albuminous, and coagulates all the other putrescible juices for about a quarter of an inch deep. If meat (venison for instance) be so treated, and then wrapt up in a thin cloth dipt in vinegar, wherein some pepper has been boiled, it may be preserved for three or four weeks in a very eatable state. The writer thinks his old friend, General JOHN STEELE, can recollect the efficacy of this experiment, tried for their common benefit about 16 years ago.

On five occasions, we have been witness to the following experiment. A leg of mutton, so tainted as to be offensive, having been well wiped, was put into a pot of boiling water: a shovel full of hot coals from the hearth was thrown into the water; the few ashes that might be taken up with it did no harm. The meat was boiled for about ten minutes; then taken out and wiped: the stinking water thrown away: fresh water with a handful of salt was put into the pot and boiled with another shovel full of hot embers, the meat being put in—When boiled a sufficient length of time, (the usual time) the meat was taken out, sweet and eatable. This experiment may be relied on.

In the last (the 8th) number of BRANDT's Journal of Science and the Arts, the following experiment is related. As Mr. BRANDT (a German by birth,) was appointed successor to Sir HUMPHREY DAVY at the Royal Institute, the authority is good. Mr. BRANDT's correspondent, at the beginning of last April, had a tin box made with a sliding cover. The common air in the box was altered by a little burning charcoal to destroy what chemists call the oxygen of the atmosphere, and upon which putrescence in a great degree depends. A layer of dry fresh charcoal in coarse powder being strewed on the bottom of the box, this was filled with alternate layers of charcoal and meat, of three kinds. The lid was put on, and to exclude the air more perfectly, it was covered with bladder. At the beginning of December, 1817, the box was opened. The charcoal had imbibed an animal odour from the meat, but there was nothing in it putrid or offensive. The meat seemed as fresh as when brought from the market; a great part of it was drest and eaten; nor was any peculiar or offensive flavour distinguishable in any part of it. A few pieces that were not drest, were left out: in about six days they began to putrefy and become offensive. These experiments should be repeated. They promise a cheap and easy method of preserving meat sweet for a considerable time, and they may be very usefully applied to the laying up of sea stores.

To this account of some of the uses of charcoal, we would add, that from experiments, and from inquiries at authentic sources, we have full reason to believe, that if meat be boiled, or stewed, or ragoued, as it ought to be for all the purposes of nutriment and frugality, a given sum of money will go four times as far in the *form of charcoal* when used in the common shallow French stoves, and the embers extinguished when the cooking is over, as it will in the *form of wood*, in a common fire place; this will be true whatever part of the country be spoken of, as well as in towns. The same application of money is equally frugal in boiling or fricaseeing meat.

On the facility of digesting meat and other food, the following experiments are curious:

Dr. HELM, of Vienna, has made some highly interesting experiments on the *stomach*. The state of one of his patients induced him to investigate more particularly the *digestive powers* of a sound stomach. He and several other healthy gentlemen partook of the same food as the patient, with this difference, that they enclosed theirs partly in tin perforated cylindrical tubes; and some of the articles which they swallowed were secured in pieces of linen. Surely a very heroic way of making experiments! Some of the results are entirely opposite to many prevalent opinions. A few shall be stated. Wheat bread is more digestible than rye bread —beans are very indigestible—pears and pine-apples better than apples—peaches, apricots, plums, figs, melons, very easily digested, even if not masticated. On the other hand, dried plums and raisins, if not masticated, swell and increase in weight; for which reason, Dr. **Helm** cautions parents not to give these dainties to children too frequently, and if these articles are used, they should be well chewed, otherwise cholics, cramps, and inflammations may arise. Chesnuts, nuts, almonds, remain undissolved—red and white turnips, potatoes, and celery, are very digestible; also, onions, raw as well as boiled—carrots, truffles or earth-nuts, parsley less, and still less digestible is horse radish—raw and boiled sour-crout, white cole, crisped cabbage, cole-rapes, are in the same degree digestible—asparagus still more so. All sorts of mushrooms are not easily digested; even if well masticated, they are not easily dissolved.

Dr. **Helm** discovered, that among animal food, veal, lamb, pork, venison and rabbit, is far more digestible than beef, mutton, and the flesh of wild hogs. Ham is very digestible; but the sward of bacon, gristle, &c. are not at all digested. *Hard boiled eggs* and *cheese* require little time to digest!—This is contrary to the general opinion.—The flesh of geese and ducks is cautioned against. Of fishes, carp, blay or bleak fish and pike, are recommended. Crabs, terrapins, frogs, snails, herrings, and oysters were entirely dissolved. Oysters! which have been so often calumniated—again a matter of rejoicing to the epicure. Of medicines, flour of sulphur, if taken alone, is insoluble; accompanied with a medium-salt a dissolution is perceptible. One would scarcely imagine how great a proportion of saliva is separated during mastication, and swallowed with the food. One pound four ounces and a quarter of victuals gained in weight, during mastication, 4 ounces, 2 drachms, and 22 grains.

MECHANICS, that branch of practical mathematics which considers motion and moving powers, their nature and laws, and their effects in machines. The term mechanics is equally applied to the doctrine of the equilibrium of powers, more properly called statics, and to that science which treats of the generation and communication of motion, which constitutes mechanics, strictly so called. The knowledge of mechanics is one of those things that serves to distinguish civilised nations from savage. It is by this science, that the utmost improvement is made of every power and force in nature; and the motions of the elements, water, air, and fire, rendered subservient to the various purposes of life: for, however weak the force of man appears to be, when unassisted by this art, yet, with its aid, these is hardly any thing above his reach. It is distinguished, by Sir Isaac Newton, into practical and rational mechanics; the former of which treats of the mechanical powers; the latter of the whole theory of motion; it shows, when the powers of forces are given, how to determine the motions that are produced by them; and conversely, when the phenomena of the motions are given, how to trace the powers or forces from which they arise.

The mechanical powers are simple engines that enable men to raise heavy weights, and overcome resistances which they could not do with their natural strength. There are six of these, which have been already referred to, viz. the lever, the wheel and axis, the pulley, the inclined plane, the wedge, and the screw. These we shall briefly describe, giving, at the same time, some account of their properties and application. The *lever* may be considered as an inflexible bar of wood or iron, used chiefly to raise large weights to small heights, it is supported by a prop or fulcrum, on which all the parts turn as the centre of motion. There are three kinds of levers, distinguished by the places in which the weight and power are applied. See Plate **Mechanics**, fig. 1.

A lever of the first kind is when the weight W is applied at one end, and the power P at the other: the fulcrum B is some where between the weight and the power. A lever of the second kind is when the fulcrum A, fig. 2, is at one end, the power at the other, and the weight between them. The third kind of lever is when the weight is at one end, and the power between the fulcrum and weight. If the weight and power change places, then fig. 2 represents a lever of the third kind. A poker in the act of stirring the fire is a lever of the first kind: the bar of the grate being the fulcrum, the coals the weight to be moved, and the hand the power. Steel yards, fig. 3, scissars, pincers, snuffers, &c. all act upon the principle of levers of the first kind. Every door turning on its hinges is a lever of the second kind, the hinges are the fulcrum or centre of motion, the door is the weight to be moved, and the hand, in opening it, is the power. An oar applied to the moving of a boat is a lever of this kind, so is the rudder of a vessel, likewise large cutting-knives, used by patten-makers, turners, chaff-cutters, &c.

A ladder to be raised against a wall is a good representation of a lever of the third kind: the wall or other obstacles against which the lower end is pushed may be regarded as the fulcrum: the top of the ladder is the weight, and the power is the strength applied.

In all the mechanical powers it is a maxim that the advantage gained is in proportion to the space passed over by the moving power.

The second mechanical power is the wheel and axis, fig. 4, which consists of a wheel A B, turning on an axis C D, and the advantage gained is in proportion as the circumference of the wheel is greater than that of the axis. The projecting spokes x have the effect of increasing the diameter and circumference of the wheel, and accordingly of increasing the power. Cranes of all kinds, windlasses, capstans, and axles turned by means of winches are to be referred to the wheel and axis.

The third mechanical power is the pulley, which is a small wheel turning on an axis with a rope passing over it. It is used to change the direction of a weight. Such is fig. 5. which gives no mechanical advantage, and is called a single fixed pulley. A B, fig. 6, is a moveable pulley to which the weight W is attached, this rises and falls with the weight, and the advantage gained by the pulley is as two to one. That is, the power P of 5 lb. will balance a weight W of 10 lb. for the power moves through twice as much space as the weight, and the advantage gained is always in proportion to the space passed over by the moving power. The advantage gained by pulleys in general, is estimated by multiplying the number of pulleys in the lower block by 2; that is, if instead of one pulley A B, there be two as in fig. 7, or five as in fig. 8, there must be as many in the upper block, and the power gained will be as 4 in the one case, and as 10 in the other. The last figure represents the solid block pulley invented by Mr. JAMES WHITE, a most ingenious mechanic.

The fourth mechanical power is the inclined plane, which is made by planks, &c. laid in a sloping direction, such is fig. 9. on which large and heavy bodies may be more easily lowered or raised, than by a mere lift Inclined planes are particularly useful in rolling casks of sugar, oil, beer, &c. into warehouses above or below the level of the street. Here it is evident power is gained in proportion as the length A D is greater than the perpendicular B D, thus if A D be 9 feet and D B only 3 feet, then a force exerted equal to 1 cwt. will sustain a weight W of 3 cwt.

The wedge, fig. 10, may be regarded as two inclined planes, and of course the gain of power is estimated in proportion as the length of the two sides B F, F A, is greater than that of the back A B. Chisels, hatchets, and other sharp instruments, which are sloped down to an edge on one side only, are to be referred to the inclined plane, and those instruments that are sloped down on both sides, act on the principle of the wedge. The chief use of the wedge consists in its being urged by the stroke of a hammer, wedge, &c. and not by mere pressure. By repeated blows the wedge is used to split wood, rocks, &c.

The last mechanical power is the screw, fig. 11, which is always turned with a handle, &c. acting like a lever, and which gains advantage in proportion as the circumference of the circle made by the lever is greater than the distance between two threads of the screw. The screw is used for pressing light bodies close together, as in presses for paper-makers, book-binders, packers, &c. A common cork-screw in passing through the cork acts upon this principle.

We have, under the article FRICTION, shewn that one fourth, or even one third of the supposed power gained must, in practice, be allowed when we calculate upon what is really gained by the mechanical powers. The capital advantages of these powers are, that by their means we can raise and move from place to place large weights, as blocks of stone, which could not be moved without them: we can give almost any direction to the moving power, and apply its action at a distance from the body to be moved. See MOTION, POWERS *moving*.

MEDAL, a piece of metal in the form of coin, intended to convey to posterity the portrait of some great person, or the memory of some illustrious action. See MINT.

Method of taking impressions or copies of valuable coins or medals.—Take fish glue or isinglass, cut it in small pieces, immerse it in clear water, and set it on a slow fire; when gradually dissolved, let it boil slowly, stirring it with a spatula, and take off the scum. The liquor being brought to a sufficient tenacity, take it off the fire, and let it cool a little, then pour it on the medal or coin you intend to copy, so that it may lay about the thickness of a crown-piece upon the medal. This done, set it in a moderate air, neither too hot nor too cold, and let it cool and dry; when dry it will loosen itself, and you will find the impression exact, and the finest strokes expressed to the greatest perfection. These you may preserve for your own study and satisfaction, or you may send them, in letters, to your correspondents abroad. You may mix this liquid with various colours, green, red, yellow, blue, &c. If you put a little parchment size to it, it will make it harder, and answer the purpose better. In this manner a fine collection may be made, which will answer for study as well as real coins or medals. A little brandy or common spirits, added to the isinglass solution, will prevent its putrefaction.

Impressions can also be taken by rubbing with any smooth instrument a piece of tin foil over the medal. Or by taking a cast in melted sulphur coloured by vermillion, thus,

Composition for casts of medals.—Melt 8 ounces of sulphur over a gentle fire, and with it mix a small quantity of fine vermillion; stir it well together, and it will dissolve like oil; then cast it into the mould, which is first to be rubbed over with oil. When cool, the figure may be taken and touched over with aqua fortis, and it will look like fine coral.

MEDALLION, a medal of an extraordinary size, supposed to be anciently struck by the emperors for their friends, and for foreign princes and ambassadors.

MEDEOLA, a genus of plants containing two species, one of which, viz. *Virginica*, is a native of the United States. It is called *Indian Cucumber*. The root is eaten by the Indians; and the editors of the *Medical Repository*, vol. I. p. 49, Hexade 2, style it the "*Delicate Cucumber Root.*"

MEDICINE, is the art of preventing, curing or alleviating those diseases, with which mankind are afflicted.

The history of medicine is lost in the remotest antiquity; we shall, therefore, confine our attention to the *effects* of medicines on the human body, and refer the reader to the article PHYSICIAN.

The operation of medicines on the human body has been attributed to various causes; several eminent physicians of the 17th and the 18th century ascribing their effects to mechanism. This opinion, however, has been strongly opposed, and, though the theory of *chemical decomposition* which now prevails among the medical philosophers of France and Germany, is more plausible, and in many instances strongly corroborated by facts, yet this, like all other conjectures tending to account for the hidden operations of Nature, does not deserve the name of a *theory*.

When judiciously administered, medicines are, doubtless, very beneficial; but if they be given or *prescribed* at random (which is but too often the case with those regular and irregular practitioners who degrade an honourable profession to a *trade*,) they seldom fail to be productive of injury:—instead of affording relief, they aggravate the complaint, and not unfrequently lay the foundation of future disease.

Particular constitutions require a peculiar treatment; and, if more attention were paid to this important circumstance, there would be less occasion for employing *drugs*. Besides, it ought to be considered, that no substances but such as contain *alimentary* matter, are conducive to the welfare of the human body, in a *healthy* condition: hence, by analogous reasoning, no drugs whatever, if devoid of nutritious properties, can be perfectly harmless, in a *diseased* state.—See PHYSICIAN, QUACKERY.

MEDICK, or *Medicago*, L. a genus of perennial plants, comprising twelve species; the principal of which are the following:

1. The *sativa*, See LUCERN.
2. The *falcata*, YELLOW MEDICK, or BUTTER-JAGS: growing wild in sandy pastures and corn-fields; flowering in the month of July.

This bushy plant, if its stalks be properly supported, attains a height of four feet: it may be easily propagated by seed, in hot, dry, barren, and sandy situations, where it produces excellent hay. Its culture deserves to be strongly recommended; as it requires but an indifferent soil; withstands the severity of winters better than lucern; and is eaten eagerly by cattle, especially by horses, though its stalks are hard and woody.

3. The *lupulina*, TREFOIL, MEDICK, or MELILOT TREFOIL; which grows in corn-fields, meadows and pastures; it flowers from the month of May till August. This species is cultivated in the county of Norfolk, under the name of *Nonsuch*, and is usually sown together with ray-grass; whence, the crops are denominated black and white Nonsuch. The trefoil medick thrives best in a loamy and swampy soil:—goats, cows, horses and sheep eat both species of this plant; though the latter is less grateful to these animals, than the former.

MEDLAR-TREE, the COMMON, or *Mespilus germanica*, L. growing in hedges, and flowering in the month of May.

This hardy shrub is cultivated in gardens, either for the sake of its fruit, for standards, or as espaliers. It will thrive in any common soil, or situation, and may be propagated either by seeds, which lie two years under ground before they vegetate; or by grafting, or inoculating it on hawthorn or crab-tree stocks. When designed for fruit-trees, they may be trained as dwarfs, for standards, or for espaliers; in either case, they are managed in a manner similar to apple or pear trees.

Grafting, or budding, is the best and most certain method of cultivating the different sorts of the medlar, so as to continue their species: after pruning their first shoots from the graft, or bud, it will be necessary to force out a proper supply of wood for raising a head; then to train the branches chiefly at full length, and to suffer the standards spontaneously to expand.

Medlars possess a subacid, vinous flavour, which to many palates is very agreeable; though disliked by others: while firm and sound, they are of a remarkably austere and repugnant taste, which, however, is completely changed, when they begin in a manner to undergo the putrefactive fermentation, so as to become soft and mellow. All the species of this fruit ripen about the latter end of October, or beginning of November; when they should be gathered; partly placed in moist bran, in several layers, to facilitate their maturation; partly deposited on straw, in the fruitery. After a fortnight, or three weeks, those kept in the bran will be catable; and the others will gradually ripen.

In their medicinal effects, medlars are very astringent, and have therefore been used with advantage in diarrhœas: on the contrary, those who are of a costive habit, ought carefully to abstain from this enticing fruit.

MEERSCHAUM or SEA-FROTH, is a very singular kind of mineral, which is of yellowish or greyish white colour, peculiarly light, and when fresh dug has nearly the consistence of wax.

The principal use to which meerschaum is applied is in the formation of the bowls or heads of tobacco-pipes used by the Turks, and the quantity consumed for this purpose is very great. It is found in a fissure of grey calcareous earth, about six feet wide, near Konie, in Natolia; and the sale of it supports a monastery of dervises established at that place. The workmen assert that it grows again in the fissure, and puffs itself up like froth. It is asserted that the Turks spread it on bread, and eat it as a medicine; and that they cover with it the heads and eyes of dead bodies previously to their interment. As it absorbs oily matters, it is occasionally used for the scouring and cleansing of different kinds of cloth.

We are informed by Pliny, that a kind of bricks were made by the ancients, so light, that after they were dried, they would float in water. He describes them to have been made of a spungy kind of earth, and to have had some resemblance to pumice-stone, which he says might be applied to the same purposes as these bricks if it could be obtained and wrought in sufficient quantity. Bricks of similar description have lately been made of a mineral substance found near Sienna, in Italy, which is supposed to be meerschaum.

MELANCHOLY, or partial insanity without any affection of the stomach, is one of those humiliating diseases which are peculiar to mankind; [arising sometimes from worms; from obstructions in the intestinal and alimentary canals, from pressure upon the brain, or inflammation of that organ, or the membranes that envelope it. It often arises from apoplectic causes.—T. C.]

Innumerable are the causes which may induce this most dreadful of human maladies; but there is one *material* circumstance, which, independently of the mental state, always occurs, and evidently operates in all melancholic patients; namely, an accumulation of impurities in the alimentary canal, consisting chiefly of *black bile*. Hence originate, want of appetite; a disturbed sleep; obstructions of the intestines; hæmorrhoidal and gouty symptoms; irregular circulation of the blood; dulness and gloom of mind, without any apparent cause; at length, stupefaction and insensibility, terminating in madness.—Indeed, the melancholic and hypochondriac are so nearly allied, that it is not always easy to discriminate between the two diseases; a distinction which is the more important, as the proper method of curing the former would inevitably be attended with fatal effects to the latter: hence we shall point out the essential difference subsisting between them. In *hypochondriac* persons, the nerves are primarily affected, and contribute to generate all those spasmodic and other concomitant symptoms which disorder the organs of the lower belly: whereas, in the *melancholic*, there already exists in the same organs a material and local cause that produces similar effects, of which the nervous system of the hypochondriac partakes only so far as he is susceptible of such impressions, in the debilitated state of his mind.

Cure. If the patient be of a full habit, blood-letting may be necessary. Next, he ought to take purgatives, consisting of neutral salts, especially tartarised kali, in doses of from two to three drachms every morning and evening, for several days.—Acidulated drinks, and a vegetable diet, will be of essential service, if combined with exercise and cheerful company.

By a strict adherence to this regimen, there is reason to hope for a complete cure, in three months. If, however, the patient be intractable, and averse to adopt any regular plan (as is too frequently the case in this complaint), he should be prevailed upon to travel; to drink purgative mineral waters; to use the cold bath; to have his head shaved, for the purpose of applying a sponge or cloths dipped in cold water; and to receive gentle electric shocks, directed from a wooden point through the region of the lower belly. On the whole, experience has evinced, that *cold* bathing is most conducive to the recovery of hypochondriacs, while the *tepid* bath best agrees with maniacs.

Lastly, it is remarkable, that the *propensity to suicide* is, strictly speaking, a characteristic symptom of black melancholy; the principal seat of which was formerly, without sufficient reason, supposed to be in the nervous texture of the spleen, and the left arch of the colon.

MELANTHIUM, *muscatoxicum* of WALTER. Fly Poison. A beautiful flowering plant, growing in the savannas of Carolina and Georgia.—A single naked spadix arises erect from a tuft of gramineous leaves, and crowned with a spike of white flowers. The leaves are eight or ten inches in length, and a half or three quarters of an inch broad: of a lively green colour, and spread round about the stem on the ground. This plant possesses deleterious qualities, and is seldom or never eaten by deer, or cattle. A strong decoction of it, sweetened, is used to kill flies.—Rats are also destroyed by it.

MELEAGRIS, the Turkey, a genus of birds of the order Gallinæ, of which there are two species. The Meleagris galipavo, or wild turkey, is a native of America, and in the northern parts of that continent these birds are found in flocks of several hundreds, which, during the day-time, resort to the woods, feeding principally on acorns, returning, at night, to some swampy grounds, where they roost upon the highest trees. In Carolina they grow to the weight of 30 or 40 pounds.

MELIA, a genus of trees, comprehending five species, one of which, though not a native, has been naturalised in the United States, and deserves notice. This species is the *M. Azederach*, which on account of its good qualities, merits particular regard.

This tree abounds in the southern states, and also bears the climate of Pennsylvania. It arrives to a great size in the southern states: and grows rapidly, if planted in a rich, loose, dry soil. It bears the names of Pride of China, Poison-berry-tree, (from the effects of the berries on birds) Pride of India, Bead-tree. The pulp surrounding the stone of the fruit, contains a large quantity of oil, of which the inhabitants of Japan, and South-Carolina and Georgia make candles, and soap. In Persia, according to MICHAUX, the pulp investing the stone, is pounded with tallow, and used in cases of *scald-head*, (*Tinea Capitis*) in children. A decoction of the bark of the root is an excellent remedy for worms, and is in general use in the southern states in that complaint. The dose is from two table spoonfuls, to a gill, three or four mornings, upon an empty stomach. [For a child of 3 years old a decoction made from 2 drachms, may be taken thrice a day for 2 days, and then a purge.—T. C.]

MELIC-GRASS, or *Melica*, L. a genus of perennial plants, comprising 14 species, of which the following are the principal:

1. The *nutans*, or Mountain Melic-grass, which abounds in the mountainous woods of the northern parts of Britain: it flowers in the months of June and July. This species is eaten by cows, horses, and goats; in the Isle of Raasay, it is manufactured into twine for fishing-nets, which are remarkable for their durability.

2. The *coerulea*, or Purple Melic-grass, growing on boggy barren meadows and pastures, and flowering in the months of July and August. This valuable plant is eagerly eaten by horses, sheep, and goats: it also affords an excellent substitute for hair, in the manufacture of brooms, which furnish considerable employment for the country people, in the western counties of England.

3. The *ciliata*, or Fringed Melic-grass.

4. The *altissima*, or Lofty Melic-grass: both are exotic, but valuable plants; as the former thrives on barren stony hills, where its stalk grows from two to three feet high, and is an excellent pasture-grass; while the latter is of a bushy nature, delights in almost every soil, and is much relished by cattle. Both species, therefore, deserve to be diligently cultivated in the northern parts of Britain, where large tracts of mountainous land produce scarcely any grass for sheep.

MELILOT, the Common, Melilot-trefoil, King's-clover, or Harts-clover, *Trifolium Melilotus officinalis*, L. an indigenous plant, growing on a stiff soil; on ditch banks; in thickets, hedges; corn-fields and meadows; flowering in the months of June and July. This plant is eaten by sheep, goats, cows, hogs, and particularly by horses, which devour it with great avidity. Its fragrance increases when dry; and if its flowers be distilled, they yield a water, which, though possessing little odour in itself, imparts a very grateful flavour to other substances. [The *melilotus purpureus odoratus*, is the plant whose seeds are employed in Switzerland to give the flavour to Sap Sago cheese.—T. C.]

MELON, the Common, or Musk-melon, *Cucumis melo*, L. an exotic plant growing wild in Asia, whence it has been introduced into the south of Europe, and is also cultivated in Britain, on account of its delicious fruit. It is propagated from seed, which should be from three to six years old, and be sown at two different periods, in order to obtain a succession of crops.

Those who wish to rear melons in perfection, must be careful in the first place, to procure good seed; secondly, to plant them remote from an inferior sort, from cucumbers, squashes, and gourds; as degeneracy *will infallibly* be the consequence of *inattention* to these directions. The kind called *Cantaleupe*, has generally been most esteemed in the United States, but the true *Cantaleupe*, having many knobs and protuberances, is never seen in the markets of Philadelphia. Of late, the *nutmeg* melon has been much propagated, for its superior flavour.

The author of *Gleanings from Books of Husbandry, London,* 1803, directs, "when the melons have gotten four leaves; to pinch off the tops with the finger and the thumb; and again, when they have two or more lateral shoots, and two or more joints: secondly, to have fine fruit, to permit but one to remain on a stalk, and to pinch off the end of the runner at the third joint above the fruit; and also new runners, that appear below the fruit, should be checked."

"Covering the plants with *mats* when the leaves droop, refreshes the plants more than watering. When the fruit appears, the plants should be but slightly watered, but the earth about the beds well moistened. The leaves must not be taken off."

To prevent the ravages of the melon fly, see Cucumber.

The second crop should be sown about the middle of March, and treated in a similar manner. When they have taken root, their management will vary but little from that of cucumbers, excepting that melons require more air, and a small quantity of water. As soon as the plant spreads into branches, it must be properly clipped, so that only two of the principal shoots may remain; and, in order to produce perfect and ripe fruit, one only should be left (with the longest stalk) and all superfluous young melons immediately removed as soon as they appear. Besides, the diseased leaves and branches, together with the forked extremities, ought to be continually cut off; and, when the fruit is *set* or formed, it will be necessary to place thin boards, stones, (or tiles) under each, and to urn it gently twice in the week, that he whole may be equally benefited by he sun and air. When fully grown, it must be plucked at a proper time, as t will otherwise lose a considerable part of its flavour. Thus, if melons be ntended for the table, they should be cut early in the morning, immersed in ce, or cold spring water, and kept in the coolest place, till they are used. The most certain criterion to ascertain the maturity of this fruit, is its cracking near the footstalk, and beginning to smell; in which state it may be gathered without delay.

MELON, the WATER, or *Cucumis Anguria*, L. though properly a species of the former, is by some considered as a distinct genus of exotic plants, comprising three species, of which one only is known in Britain, by the name of *Citrul*. It is cultivated in all the warm countries of Europe, and also in Asia, Africa, and America, where its salubrious and cooling fruit is greatly esteemed.

The water-melon is propagated from seed, in a manner similar to the former. In its properties, this species nearly resembles the preceding; but partaking more of the nature of cucumbers, water-melons require a larger proportion of spice and wine; as otherwise they are apt to induce flatulency or diarrhœa.

The cultivation of the water-melon is so well understood in the United States, that no directions on the subject are requisite in this place. They afford a very refreshing article of diet in our warm summers; and yield considerable profit. The juice of the sweeter kind yield, on inspissation, a bright light-coloured syrup, which would answer every purpose required of any syrup. Mr. HENRY DRINKER, of Philadelphia, procured half a pint of this syrup, from 14 lbs. of melon-juice, a part of which I tasted, and found very pleasant. Mr. BORDLEY, who is practically acquainted with the cultivation of the fruit, makes the following calculation upon Mr. DRINKER's experiment.

"Melons growing at 5½ by 5½ feet apart, are 1433 plants on an acre: these bearing two melons of 14 lb. each, yield 4000 lb. of melons, 1433 pints of syrup; which, at 10 cents, would come to 143 dollars, for an acre's produce."

Taking the amount at one half the above sum, it would be more than is produced from many acres of land, in other cultivation, in sandy impoverished soils. Having millions of acres covered with the sugar maple, and thousands of acres fit only for the cultivation of the water-melon, the United States need be under no apprehension of the want of sugar. Dr. PALLAS, in the account of his journey to the southern provinces of Russia, in 1793 and '94, speaking of a colony of Moravians at Sarepta, or Sarpa, on the river Volga, says: "The ingenious inhabitants of this town brew a kind of beer from their very abundant and cheap water-melons, with the addition of hops: they also prepare a conserve or marmalade from this fruit, which is a good substitute for syrup or treacle."

MEMBRANE, in anatomy, a pliable texture of fibres, interwoven together in the same plane.

MEMORANDUM, a term implying a note, or mark, made either on paper or otherwise, with a view to assist the memory.

In the present artificial state of society, the convenience of a *memorandum-book* is obvious to every person engaged in active pursuits. And though the utility of such a measure be universally acknowledged, yet there is reason to believe that it is not so extensively practised as it justly deserves. Those who reflect on the fleeting nature of human thought, and on the importance of remembering the *train of ideas* which lead to a certain conclusion, will readily admit that annotations might be rendered equally interesting and useful, if they were extended to that department of human affairs, which more immediately relates to the operations of the human mind. Thus, if every striking idea, whether of an economical or intellectual tendency, were duly registered and digested, when a more favourable opportunity offers, incalculable benefit would thence result to society. Hence we presume to suggest to those who are accustomed to reflect and attend to the progress of their reasoning (when in solitude, as well as in the common intercourse of life), to note and record in a particular journal, all such sentiments and opinions as appear to be worthy of being *preserved*. See also JOURNAL.

MEMORANDUM, COMMON PLACE, or POCKET-BOOK. The necessity of keeping a faithful narrative of circumstances appertaining to business is fully apparent to every man. The interest we have in the occurrences of past life, as a guide to our future pursuits, is undoubtedly of considerable importance to the man of leisure and observation; and the arrangement of these events to a philosophical observer of nature, from the multiplicity of interesting objects which are perpetually before him, is undoubtedly of great importance.

The following method has been used by a respectable gentleman of the United States for some years, who finds it still to answer his end very well.

The first column is generally left open until either the postings are done in the ledger, or the alphabetical arrangement of the vol. has taken place.

The second contains the beginning head of common occurrences.

The third is devoted to the Dr. of acct. lying open, when monies are paid, or goods transmitted.

The fourth devoted to the commencements of improvements, or experiments in agriculture, gardening, or chemistry.

When this volume is filled, an alphabet may easily be made by the initials in the first column, and the figures therein, will shew that the different accounts in the ledger, are posted with the journalised entries.

1st.	2d.	3d.	4th.	*January* 1, 1820.	
	Stiles			(John) agreed to serve me for the ensuing year at 120 dolls. per ann.	
	Henry			at farming, on the new road over swamp, all day.	
	Self			Balanced accts. with A. B.	
	Bean			paid in full—See his account.	
$\frac{5}{4}$		Charges		to cash for Christmas boxes	2 25
$\frac{3}{4}$		Farming		to cash, paid for new handkfs.	7 75
	Choice			(Mr.) called and had his power of attorney corrected and forwarded.	
	Mease			(Doctor) wrote to. See copy.	
			Peas	had my first crop put in this morning on S. side of Bowley.	

And during the time such a pocket volume is filling, if any common occurrence is sought, such as the number of days any labourer has worked, or any specific agreement made, or any particular event taken place, by running the finger down the second column it will soon be manifest. If on accounts of payment being made, the third will shew it, and if any experiments have been made, in any of the three branches alluded to, the fourth will shew every particular concerning them. The first column should not be filled up except to alphabet by, or when the postings are made.

MEMORY, a mental faculty, which consists in the power of reviving former impressions of our ideas, or the particular circumstances which occasioned and accompanied them. [It is best explained by Dr. Hartley, on the principle of the association of ideas. See his "*Observations on Man.*"—T.C.]

Memory, *artificial.* The principal difficulty in attaining a competent knowledge of history, consists in retaining the dates of the several epochas, æras, &c. to which the principal facts and occurrences in history belong. This difficulty is chiefly obviated by "memorial lines," made up of artificial words, invented, or adopted, by the late Dr. Grey: the use and application of these may be denominated "Artificial Memory," or, according to the inventor, MEMORIA TECHNICA.

"Of all things," says a celebrated philosopher and scholar, "there is the greatest difficulty in retaining *numbers.* They are like grains of sand, which will not cohere in the order in which we place them; but by transmuting the figures into letters, which easily cohere, in every form of combination, we fix and retain numbers in the mind with the same ease and certainty with which we remember words. Thus when Dr. Grey, in his Memoria Technica, annexes a chronological date to the *termination* of the name, it is only pronouncing it with his variation, and we instantly recollect its proper date. For example, if we remember that Dr. Grey calls Rome Rom-*put*, which the oddness of the variation will make us less liable to forget, since, as we shall hereafter see, he makes *p* stand for 7, *u* for 5, and *t* for 3, we immediately recollect, that 753 is the date usually assigned to the building of Rome. If, moreover, we can learn to repeat the names of the kings of England, in the order in which he has digested them, we shall have not only the years, when each of them began to reign, but also the order of their succession. As this method is so easily learnt, and may be of so much use in recollecting dates, when other methods are not at hand, particularly in conversation and reading history, when dates are often wanted, I think all persons of a liberal education inexcusable who will not take the small degree of pains that is necessary to make themselves masters of it, or who think any thing mean or unworthy of their notice, which is so useful and convenient."

To remember any date in history, chronology, &c. a word is formed, the beginning of which being the first syllable, or syllables, of the thing sought, and the last syllable, or syllables, give the date.

In this art, letters stand for numbers: thus, the five vowels *a e i o u*, stand for 1, 2, 3, 4, 5; these combined, make diphthongs, as *au, oi, ou*, which represent the numbers, 6, 7, and 9: *e i*, as the first letters of the word, stand for *eight*.

Consonants being required as well as vowels, we have *b, d*, standing for 1 and 2, as the first two consonants: *t, f, s, n*, for *three, four, six*, and *nine*; *l* stands for *five*, *p* for *seven*, *k* for *eight*, and *y* and *z* for a cypher or 0.

The whole method in explained in the following table:

a	*e*	*i*	*o*	*u*	*au*	*oi*	*ei*	*ou*	*y*
1	2	3	4	5	6	7	8	9	0
b	*d*	*t*	*f*	*l*	*s*	*p*	*k*	*n*	*z*

Here it is evident that *a* and *b* stand for 1; *e* and *d* for 2; *i* and *t* for 3; *o* and *f* for 4; *u* and *l* for 5; and so on. The letters are arbitrarily assigned, but we may observe, that *a* and *u* stand naturally for 6; because *a* stands for one, and *u* for five, and 1+5=6, for a similar reason *oi* stands for 7; and *ou* for 9; *l* stands for 5, being, as Dr. GREY observes, the Roman letter for 50, *p* stands for 7, as being the emphatic letter in the word se*p*tem, seven; and for a similar reason *k* stands for 8, *okto* the Greek for eight.

The foregoing table being committed to memory, with the explanations, the next thing to be done by the learner, is to obtain the habit of forming technical words to any combinations of figures.

Examples.

10	325	399	1921	1491	680	1810
az	*tel*	*toun*	*aneb*	*ofna*	*seiz*	*akby*

It must be remembered that the *y* is pronounced broad to distinguish it from the *i*, and where it can be done conveniently, it is pronounced like the *w*, as *syd*, is pronounced swid, *typ*, twip, &c.

Suppose I wish to remember the date of the death of *Milton*, and know that it happened in the year 1674; I will make use of the first four letters of the name, and add to them the technical syllable *asoif*, for the year, *a* being 1, *s* 6, *oi* 7, and *f* 4; thus the word is Milt*asoif*.

Where many cyphers come together, as 1,000, 1,000,000, *g* stands for 100; *th* for 1,000; *m* for 1,000,000, thus, *ug* stands for 500; *eith* 8,000; *um* 5,000,000, *augm* six hundred million. The same date or number may be expressed by different words according as vowels or consonants are used to represent the figures, or begin the words.

pei	*tel*	*buf*	*alf*	*ni ola*
78	325	154, or	154;	93,451
oik	*idu*	*blo*	*alo*	*out olb.*

This variety gives scope for choice in the formation of words; so that such terminations and combinations may be made use of, as by their singularity will be best remembered, or which may be most adapted to the thing by any accidental relation or allusion. Thus the year of the world in which Eneas is supposed to have settled in Italy, is 2824, which number may be expressed by *ekef*, or *deido*, the latter is preferable to the former, because of the connexion in the story between Eneas and Dido, and therefore the technical word Ene*deido*, is better than Ene*kef*

Again, Inachus, king of Argos, began his reign in the year before Christ 1856, which, with a very small change in the spelling, may still possess the original sound, and yet point out the number required, as Ina*kus*.

To shew in what way artificial memory is applied to Chronology,

The ages of the world before the time of Christ, are divided by Chronologers into six periods: viz. the *first*, from the Creation to the Deluge; *second*, from the Deluge to the call of Abraham; the *third* epocha is the call of Abraham; the *fourth* the *Exodus*, or departure of the Israelites from Egypt; the *fifth*, the foundation of Solomon's Temple; the *sixth* is denominated from Cyrus, or the end of the Jewish captivity.

These six periods, or epochas, are expressed by the following line,

Cr*oth*, Dele[illegible]*k*, Ab*aneb*, Ex*afna*, Temb-
ybe, Cyr*uts*.

Before Christ.
1. CREATION of the world, Cr-*othf*. 4004
2. The general DELUGE. Del-*etok*. 2348
3. The Call of ABRAHAM. Ab-*aneb*. 1921

Before Christ.

4. Exodus, or the departure of the Israelites from Egypt, Ex-*afna* 1491

5. The foundation of Solomon's Temple, Tem-*bybe* 1012

6. Cyrus proclaimed liberty to the Jews, Cyr-*uts* 536

CR, denotes the creation; *o* stands for 4; *th* for thousand; and *f* for 4. DEL, the deluge, *etok*, 2348 according to the rules before mentioned; AB for Abraham; EX, the Exodus; TEM the Temple, and CYR, Cyrus.

The other general epochas, &c. are comprised in the following lines.

Troy-*abeit*, Olym-*pois*, Rom-*put*, et Ær Nabonas-*pop*.

Phil-*ido*, Contrac-*tad*, + Diocles-*eko*, Mahom-*audd*, Yez-*sid*.

7. The destruction of Troy Troy-*abeit*. 1183

8. The first Olympiad. Olym-*pois*. 776

9. The building of Rome. Rom-*put*. 753

10. The æra of Nabonassar. Ærnabonas-*pop*. 747

11. The Philippic æra, or death of Alexander the Great. Phil-*ido* 324

12. The æra of Contracts. Contrac-*tad*. 312

13. The Dioclesian æra. Diocles-*eko*. 284

14. The æra of the Hegira, or flight of Mahomet from Mecca to Medina. Mahom-*audd*. 622

15. The æra of Yezdegird, or Persian æra. Yez-*sid*. 632

The mark + signifies the birth of Christ, and all dates after it are reckoned from that period. This æra is used by Christians in all parts of the world, who began to reckon from it about the year 360, which, however, was too far distant from the age in which Christ lived, for chronologers to fix with certainty the true time of that important event.

An æra, as we have seen, is a date from which the reckoning begins by years: thus the Greeks reckon from the beginning of their Olympiads: the Romans from the building of Rome: the Syrians, and most of the Eastern nations, from the conquest of Babylon by Seleucus. The word *era* is supposed to owe its origin to the Spaniards, it being usual with them in the time of Augustus, to write against any occurrence, the date with the following letters, A.ER.A. that is, "Annus erat "Augusti," hence *aera*, *æra*."

The three lines, therefore, which comprise all the general epochas, and æras, ecclesiastical and civil, are as follow.

Cro*thf*, Del*etok*, Ab*aneb*, Ex*afna*, Tem*bybe*, Cyr*uts*.

Troy*abeit*, Olym*pois*, Rom*put*, et Ær Nabonas*pop*.

Phil*ido*, Contrac*tad*, + Diocles*eko*, Mahom*audd*, Yez*sid*.

We shall now give two or three other examples, pointing out its utility in the study of history, as connected with the chronological history of states and kingdoms.

The Regal Table of England since the Conquest, and some of the most remarkable Princes before it.

Bef. Christ.

Casibelanus chosen chief Commander by the *Britons* against the invasion of *Julius Cæsar* [Casibel *ud*] 52

Aft. Christ.

Queen Boadicea, the *British* heroine, being abused by the *Romans*, raises an army, and kills 7000 [Boad *aup*] 67

Vortigern, who invited the *Saxons* to the assistance of the *Britons* against the *Scots* and *Picts* [Vortig *fos*] 446

Hengist the *Saxon*, who erected the kingdom of *Kent*, the first of the heptarchy [Heng *ful*] 455

King Arthur, famous for his powerful resistance and victories over the *Saxons* [Arth *laf*] 514

Egbert, who reduced the heptarchy, and was first crowned sole monarch of *England* [Egbe *kek*] 828

Alfred, who founded the University of *Oxford* [Alfre *kpe*] 873

Canute the *Dane*, [Can *bau*] 1016

Edward the Confessor [Confes *fe*] 1042

William the Conq. [Wil-con *sas*] *Oct.* 14. 1066.

William Rufus [Ruf *koi*] *Sept.* 9. 1087

Henry I. [Hen *rag*] *Aug.* 2. 1100

Stephen [Steph *bil*] *Dec.* 2. 1135

Henry the second [Hensec *buf*] *Oct.* 25. 1154

Richard I. [Ric.*bein*] *July* 6. 1189

John [J *ann*] *April* 6. 1199

Henry the third [Heth *das*] *Oct.* 19. 1216

Edward I. [Ed *doid*] *Nov.* 16. 1272

Edvardus secundus [Edse *typ*] *July* 7. 1307

Edvardus tertius [Edter *tes*] *Jan.* 25. 1326

Richardus secundus [Risec *taip*] *June* 21. 1377

Henry the fourth [Hefo *toun*]	*Sept.* 20.	1399
Henry the fifth [Hefi *fad*]	*March* 20.	1412
Henry the sixth [Hensi *fed*]	*Aug.* 31.	1422
Edvardus quartus [Edquar *fauz*]	*March* 4	1460
Edward the fifth } Efi-R }	*April* 9.	1483
Richard III. } *okt* }	*June* 22.	1483
Henricus septimus [Hensep *feil*]	*Aug.* 22.	1485
Henricus octav. [Henoc *lyn*]	*April* 22.	1509
Edvardus sextus [Edsex *los*]	*Jan.* 28	1546
Mary [Mary *lut*]	*July* 6	1553
Elisabeth [Els *luk*]	*Nov.* 17.	1553
James I [Jam. *syd*]	*March* 24	1602
Carolus Primus [Caroprim *sel*]	*March* 27.	1625
Carolus secundus [Carsec *sok*]	*Jan* 30	1648
James II. [Jam *seif*]	*Feb.* 6	1684
William and Mary [Wil *seik*]	*Feb.* 13.	1688
Anne [An *pyb*]	*March* 8.	1701
George I [Geo *bo*]	*Aug.* 1	1714
George II [Geosec *doi*]	*June* 11.	1727
George III. [Geoter *sy*]		1760

MEMORIAL LINES.

Casibel *ud* Boad *aup* Vortig *fos* Heng *ful* & Arth *laf*

Egbe *kek* Alfre *kpe* Can *bau* Confes *fe* Wil-con *sau*

Ruf *koi* & Hen *rag*——

Steph *bil* & Hensec *buf* Ric *bein* J ann Heth *das* & Ed *doid*

Edse *typ* Edter *tes* Risec *toip* Hefo *toun* Hefi *fad* que.

Hensi *fed* Edquar *fauz* Efi-R *okt* Hensep *feil* Henoc *lyn*.

Edsex *los* Mary *lut* Els *luk* Jam *syd* Caroprim *sel*.

Carsec *sok* Jam *seif* Wil *seik* An *pyb* Geo *bo—doi-sy*.

N. B After *Canute* inclusive, one thousand is to be added to each. It was thought unnecessary to express it, it being a thing in which it is impossible that any one should mistake.

As another example we will take the Chronological Miscellanies since the Conquest.

	Aft. Christ.
Jerusalem regained from the *Turks*, and Godfrey of Bulloigne made king of it [Godbul *nou*]	1099
The Inquisition first erected against the *Albigenses* [Inquis *ded*]	1222
The Confirmation of Magna Charta by king *Henry* III. [Chart *eel*]	1225
Wat Tyler's Rebellion suppressed [Tyl *ika*]	1381
Jack Cade's Rebellion suppressed [Cade *fly*]	1450
The Mariner's Compass found out [Comp *atze*]	1302
Gunpowder invented in *Germany* by a monk [Gunp *atfo*]	1344
The invention of Printing [Prin *afon*]	1449
Christopher Columbus, a native of *Genoa*, discovers *Cuba* and *Hispaniola* [Colum *bont*]	1493
Martin Luther begins to preach in *Germany* against Indulgences, and other Errors of the Church of *Rome*, [Mar-luth *lap*]	1517
The Name of Protestants first began on Occasion of the Protestation of the *Lutherans* made against a decree of the chamber of *Spire* against them [Pro-*talen*]	1529
The Smalcaldan League, oragreement made between the Protestants of *Germany* for their mutual defence, at *Smalkald* [Smalcal *loz*]	1540
The council of Trent began Dec. 13 [Trendec *at alfu*]	1545
The Massacre of Protestants at Paris [Maspar *aloid*]	1572
The United provinces, under the protection of *William* prince of *Orange*, throw off the *Spanish* yoke [Un-p *loin*]	1579
The Spanish Invasion [Sp-inv *ukk*]	1588
The Gunpowder Treason [Powd *syl*]	1605
The famous Rebellion at *Naples*, on occasion of the grievous Excesses, headed by Massanello [Masanel *sop*]	1647
Oliver Cromwell usurps the Government of *England*, under the name of Protector [Crom *sli*]	1653
The Island Jamaica in *America* taken by the *English* [Jamaic *aull*)	1655
Cromwelli Mors [Crom-mor *suk*]	1658
Gibraltar taken by the *English* [Gibra *pzo*]	1704

Memorial Lines.

God-bul *nou* Chart *eel* Inquis *ded* Tyl *ika* Cade *fly*.

Comp *atze* Gunp *atfo* Prin *afon* atque Colum *bont*.

Mar-luth *lap* Prot *alen* Smalcal *loz* Tren-dec *at-alfu*.

Mas-par*aloid* Un-p*loin* Sp-in *leik* Powd *syl* Masanel *sop*.

Crom *sli* Jamaic *aull* Crom-mor *suk* capta Gibra *pzo*.

N. B. A thousand is to be added, as above, where it is not expressed.

We shall give an instance of the method of applying the *Memoria Technica* to other subjects, taking as an example, the

Distances of the Planets from the sun.

	Miles.
The distance of Mercury from the sun is	37.000.000
———Venus———	66.000.000
———Earth (Terra)———	95.000.000
———Mars———	145.000.000
———Jupiter———	493.000.000
———Saturn———	903.000.000
———Herschel———	1813.000.000

The words answering to these are,
Mer *ip*, Ven *suu*, Terra *nu*, Mars *afu*,
Jup *oni*, Satur *nyt* et Hers *akbi*.

In the same way, Dr. GREY, to whom we are indebted for this article, has applied the invention to Geography for the more ready recollection of the divisions of the world and the various countries of it, to the position of the several rivers, &c. Likewise to the knowledge of weights, measures, coins, &c. It may also be applied to any circumstance whatever, in which the ready recollection of numbers is expedient and useful. The following example taken from "the *Familiar Introduction to the Arts and Sciences*," will shew how the check numbers given in passing turnpikes may be easily remembered without being troubled with the tickets, "Suppose," says the author, "I ride from the City to Fulham by the City-road, Paddington, &c. if the numbers be as follows, then the adjoining words will assist the memory,

Old-Street turnpike	763.	Old-St. *oisi*.
City Road - - -	95.	Cit *nu*.
Battle-Bridge - -	540.	Bat.Br. *ufy*.
Paddington Road	889.	Pad *kein*.
Edgeware Road	39.	Edge *in*.
Hyde Park corner	481.	HydeB.*oka*.
Fulham Road - -	27.	Ful. *ep*.

See JOYCE's Introduction to the Arts and Sciences, p. 101.

MENSTRUUM, in general, signifies all liquors employed as solvents of other bodies, with the minute particles of which the former combine, so as to produce a new uniform compound: they are chiefly used for extracting the virtues or ingredients of matters more solid than themselves, by infusion, decoction, distillation, &c.

Water is the solvent of all salts, vegetable gums, and animal jellies. Rectified *spirit of wine* is the menstruum of the essential oils and resins of vegetables, of soap, &c. *Oils* dissolve vegetable resins and balsams, wax, animal fat, mineral bitumens, sulphur, and certain metallic substances, particularly lead: yet, for this purpose, the expressed oils are more powerful *menstrua* than the distilled; because the former are not so liable as the latter to be volatilised in a strong heat, which in most cases is required for enabling them to produce the desired effect.

All *acids* act as solvents of alkaline salts and earths, as well as metallic bodies; but their action greatly varies on different metals; thus, the *vegetable* acids dissolve a large proportion of zinc, iron, copper, tin, and antimony, but particularly lead, if previously corroded by their steam. The *marine* acid, or spirit of salt, dissolves zinc, iron, and copper; and, if combined with the *nitric* acid, or aqua fortis, a proper menstruum is obtained for gold and antimony. The *vitriolic* acid, or oil of vitriol, acts upon zinc, iron, and copper: it also corrodes or imperfectly dissolves most other metals.

Alkaline lixivia, or leys, dissolve oils, resinous substances, and sulphur: by adding *quick-lime*, they become more pure and powerful, as is evident in the preparation of common soap.

Solutions effected in water, and spirit of wine, possess the virtues of the substances dissolved; but oils generally sheathe their strength while acids and alkalies change their qualities. Thus, water and distilled spirits are the proper *menstrua* of vegetable and animal matters, the efficacy of which is to be preserved.

Most of the solutions mentioned are easily made, by pouring the menstruum on the substance to be dissolved, and exposing both, for some time, to a proper degree of warmth. Oils and alkaline liquors generally require a strong heat to increase their solvent power; and acids, likewise, do not act on some metals without this aid. Watery and spiritous menstrua may be rendered more expeditious by a moderate heat; and the quantity they hold in solution, will be greater than without this assistance; but, on becoming cold, that proportion of soluble matter which was, in a manner, kept suspended by heat, again subsides. As the action of acids on metallic bodies is generally attended with heat, effervescence, and a copious discharge of fumes, which are highly inflammable, such as those arising from the solution of iron in the vitriolic acid, the operator ought never to approach the vessel with a candle, or other burning substance; as the exhaling vapour would thus instantly be set on fire, and cause an explosion.

Lastly, there is another species of solution, in which the moisture of the atmosphere is the menstruum. If fixed alkaline salts or earths, for instance, potash, as well as the neutral salts composed of the former, and the vegetable or any other acids (except the vitriolic, and some metallic salts,) be exposed for some time to a moist air, they gradually absorb humidity, and at length become liquid; a process which is termed *deliquation.*

MENSURATION, is the art of ascertaining the contents of superficial areas, or planes, and of solids: it is also applied to determine the lengths, heights, depths, or distances of bodies and objects. It may therefore include Longimetry or the art of measuring lines: Planimetry or the method of measuring surfaces: Stereometry or the art of measuring solids, which includes Guaging and Trigonometry; to the last article the reader is referred in the alphabetical arrangement.

Accessible lines are measured by applying to them some certain measure, as an inch, a foot, a chain, &c. a number of times repeated. Inaccessible lines must be measured by angles which are taken with a QUADRANT, which see. The measure of a plain figure is called its area, which determines the extension of bodies as to length and breadth. When we speak of the area of a figure, we refer to the measure of its surface without any regard to its thickness, and the surface of any body is measured by squares, as square inches, square feet, square yards, &c. that is, by certain figures whose sides are inches, feet, yards, &c. according to the following

TABLE.

144	square	inches	make	1	square	foot
9	—	feet	—	1	—	yard
30¼	—	yards	—	1	—	pole
16	—	poles	—	1	—	chain
10	—	chains or 4 sq. rds.		1	—	acre
4840	—	yards	—	1	—	acre
640	—	acres	—	1	—	mile

The area of a parallelogram, of any kind, is found by multiplying the length by the perpendicular height; thus the area of a paved yard, 80 feet long by 50 feet wide, is found by multiplying 80 by 50, equal 4,000 feet, the value of which, if the stone be reckoned at 1*s* 3*d*. per foot, is 250*l* Again the area of a triangle is found by multiplying the base by the perpendicular height, and dividing the product by 2, thus if the triangular hip of a house be 20 feet in height and the base be 30 feet long, then

$$\frac{20\times30}{2}=300$$ feet is the measure of the said hip. Now as slaters, tylers, &c. measure their work by squares of 100 feet each, a person will have to pay for three squares for slating such a triangular hip of a roof. It is evident that all right-lined figures, of whatever shape, may be divided either into parallelograms or triangles, and when so divided may be easily measured.

The circumference of a circle is found by multiplying the diameter by 3.1416: thus, if a circle be 45 feet in diameter, its circumference will be $3.1416\times45=141.372$ feet. And the area of a circle will be found by multiplying the square of the diameter by .7854, thus the area of a circle, whose diameter is 20 feet, is equal to 20^2 or $20\times20\times7.854=314.1600$ equal to little more than 314 square feet.

A solid is a figure that has length, breadth, and thickness, and its measure is called its solidity, capacity, or contents. Solids are measured by cubes, whose sides are yards, feet, inches, &c. and the solidity, capacity, or contents is said to be so many cubical inches, feet, &c.

TABLE.

1728	cubic	inches	make	1	cubical	foot
27	—	feet	—	1	—	yard
166⅜	—	yards	—	1	—	pole
64000	—	poles	—	1	—	furlong
512	—	furlongs	—	1	—	mile

The solidity of any cubic figure is found by multiplying the area of the base by the height. Thus, if I enquire how many cubical feet there are in a block of stone, whose sides are 30 inches long, and what it weighs, supposing there are 16 feet in a ton, I say

$30\times30=900=$ area of the base

$900\times30=27000=$ cubical inches, and

$$\frac{2.7000}{1728}=15\ 5$$ cubical feet which will weigh nearly a ton.

Again to find the contents of a leaden water cistern, in cubical inches, and likewise in gallons. Suppose the cistern to be 5 feet long, 3 feet wide, and 2 feet deep

$5\times3=15$ feet $=$ area of the base

$15\times2=30$ feet $=$ cubic contents in feet

$30\times1728=51840=$ cubic inches, and 282 inches being equal to one gallon,

therefore $$\frac{51840}{282}=183$$ gallons.

On this principle depends the whole business of gauging; and by similar means we can find the contents or capacity of any figure whatever. Thus to find the contents of a sphere, the rule is "Multiply the surface by one third of the radius, and the product will be the solidity;" or, what will come to the same thing, "Multiply the cube of the diameter by the decimals .5236." Example: what are the solid contents of the earth, supposing its diameter to be 8000 miles in length? 8000 × 8000 × 8000 = 512,000,000,000 and this last product multiplied by .5236 = 268,083,200,000 miles.

French System of Mensuration.

LONG MEASURE.

Metres.		*Toises.*	*Feet*	*Inch.*	*Lines.*
10,000 000	equal a quadrant of the meridian, or	5,132,430			
100.000	100th part of a quadrant	51,324			
1,000	1 millaire or mile	513			
100	1 stadium, } agrarian measure	51 3243			
10	1 perch, } agrarian measure	5 13243			
1	1 metre or rectilinear unit		3	0	11 44*
1-10 or 0.1	1 decimetre or palm		0	3	8.344
1-100 or 00.1	1 millemetre		0	0	.443

* Equal to 39.371 inches English.

SUPERFICIAL MEASURE.

Square metres.		*Square feet.*
10,000	1 are, or superficial unit, (being a square the side of which is 100 metres in length)	94831
1000	1 deciare, or tenth of an are; a superficies 100 metres long, and 10 broad	9483.1
100	1 centiare	948.31

MEASURES OF CAPACITY.

Cubic decimetres.		*Paris pints.*	*Paris bush.*
1000	1 cubic metre or cade, or tun	1051 1-2	78 9
100	dedicade, or setier	105.1-7	7.89
10	centicade, or bushel	10 1-2	.789
1	cubic decimetre, or pint	1.1-20	.0789

WEIGHTS.

Cub. dec. of water.		*French pounds.*			
1000	a cubic *metre*, or *cade* of water, called a bar or millier	2044.4			
100	a decibar or 1-10 of a bar	204 44			
10	a centibar, or decal, or 1-100 of a bar	20.444			
		lb.	*oz.*	*gros.*	*grains.*
1	1 grave or pound	2	8	5	49
.1	1 decigrave, or 1-10 of a grave	0	3	2	12.1
.01	1 centigrave, or dram, or 1-100 of a grave	0	0	2	44.41
.001	1 gravet, or maille, the weight of a cubic centimetre of water	0	0	0	18.841
.0001	1 decigravet, or grain	0	0	0	1.8841
.0000	1 centigravet	0	0	0	0.18841

MEPHITIC, in natural history and chemistry, a term equivalent to *noxious*, or *poisonous*, and applied generally to vapours of that description. The gases, now called *hydrogen* and *azote*, are by some authors styled *mephitic airs*.

MERCATOR'S-CHART, is a projection of the surface of the earth in plano; so called from Mercator, a Flemish Geographer, who first published maps of this sort in 1556 In this chart or projection, the meridians, parallels, and rhumbs, are all straight lines, the degrees of longitude being every where increased so as to be equal to one another, and having the degrees of latitude also increased in the same proportion; namely at every point on the globe, the degrees of latitude, and of longitude, or the parallels, are increased in proportion of radius to the sign of the polar distance, or co-sine of latitude, or in the proportion of the secant of the latitude to radius, a proportion which has the effect of making all parallel circles to be represented by parallel and equal right lines, and all the meridians by parallel lines also, but increasing infinitely towards the poles.

MERCURY, or Quicksilver (*Hydrargyrus*), a mineral fluid, about fourteen times heavier than water: or in the temperature of 60 of Fahrenheit about 13,6, but when frozen it is above 14 It is so remarkably *thin*, that it requires the intense cold of 40 degrees below 0, of Fahrenheit's scale, to render it solid. When exposed to fire, it may be totally volatilised.

Mercury in its native state is called *quicksilver*, and is found in small globules of shining, silvery appearance, scattered through different kinds of stones, clay, and ores. It is nearly fourteen times heavier than water.

The principal ore of mercury, and that from which the metal is chiefly obtained, is *cinnabar* This is of red colour, and consists of mercury mineralised with sulphur. It is sometimes found in a massive state, sometimes in grains, and sometimes crystallised. The most productive mines of cinnabar are in the palatinate of Germany, at Idria in Bohemia, and at Almaden in Spain. Mercury is also brought into Europe from the East Indies and from Peru.

The mines of Idria are supposed to be more productive than any of the others. Their first discovery, which was somewhat more than three hundred years ago, was in a very extraordinary manner. This part of the country was then much inhabited by coopers, and one of the men on retiring from work in the evening, placed a new tub under a dropping spring, to try if it would hold water; and when he came in the morning, found it so heavy that he could scarcely move it. Examining into the cause of this extraordinary circumstance, he found it owing to a shining and ponderous fluid which was at the bottom. The affair was noised abroad, and a society of persons was formed to search further, and discover the mine from whence this quicksilver had flowed. Such was their success that the reigning Duke of Austria paid them a compensation for the discovery, and took the mine into his own possession. The greatest perpendicular depth of this mine is now more than 830 feet. It is descended by buckets, or by ladders placed obliquely in a zig-zag direction. In some parts of the mine the pure metal flows in small streams, so that in six hours a man has been known to collect more than thirty-six pounds weight of it. In other parts it is found in a multitude of little drops, either in ores or in clay: but the principal quantity is extracted from the cinnabar, by mixing it with half its weight of iron-filings, and distilling it in a stone-ware retort. By this process the sulphur combines with the iron, and the mercury in a state of purity passes into the receiver. The whole produce of the above mine is said to have exceeded a hundred tons weight of mercury per annum.

When the pure or native mercury occurs in mixture with other substances, these are stamped or ground into a coarse powder. Water is poured upon them, they are briskly stirred until the water becomes thick and turbid, and then left to settle. This operation is performed till the water runs off perfectly clear. The substance at the bottom, which is principally mercury, is then put into large iron retorts, and the metal is obtained, free from all extraneous substances, by distillation.

It is the singular property of this metal, which has no other alliance whatever with silver than its appearance, to be capable of division, by the least effort, into an indefinite number of particles, each of which invariably assumes a spherical form; and to be always in a fluid state in the common temperature of our atmosphere. Even during the most intense frost, it still retains its fluidity. By the effect, however, of extreme cold, artificially produced, mercury becomes a solid metal, and in this state may be beaten with a hammer and extended without breaking: but care must be taken that it do not touch the fingers, since it would blister them and cause unpleasant sores, in the same manner as any burning substance.

Mercury has been known from the remotest ages; and was employed by the ancients in gilding, and in the operations of separating gold and silver from their ores, in the same manner as at present. It is used for making barometers, in the glass tubes of which it ascends and descends, as the column of air presses more or less upon it; and, as heat dilates mercury similarly to other fluids, it is likewise made into thermometers.

Corrosive sublimate is an extremely poisonous preparation from mercury; and from corrosive sublimate and mercury, rubbed together until they are perfectly incorporated, is formed *calomel*.

The combinations of mercury with other metals are termed amalgams. That of mercury and gold is formed so readily that if gold be dipped into mercury its surface immediately becomes as white as silver. An amalgam of mercury and gold is employed for the gilding, and of mercury and silver for the silvering of metals. Mercury and tin combined together form the substance which is used for the silvering of looking glasses.

The preparation of *artificial cinnabar* was known to the ancients. This is the red pigment called vermillion. It is usually formed of three parts of mercury and one of sulphur, melted together, heated to redness, and then sublimated out of contact of the air. The manufacture of vermillion was long kept a secret by the Dutch; and it is stated that before the late war, nearly 50,000 pounds weight of it were annually made, in three furnaces, by four workmen, near Amsterdam.

Independently of its utility in various manufactures, mercury is extensively employed in medicine; and, though it is the most violent of poisons, when taken inadvertently in too large quantities, yet, if judiciously administered, it has frequently effected a cure, after all other medicines had failed to procure relief. When taken into the stomach undivided, or in its native state, this fluid metal almost instantly passes through the intestines unchanged, and produces no perceptible effect, except that of promoting evacuation, if any crudities or obstructions should prevail in the alimentary canal. Hence it might be advantageously prescribed in the *first* stage of the Iliac Passion, before the bowels are too much weakened and corroded by the stagnant fœces; especially if it be given together with castor-oil or fat broth, but no spice. The patient, after taking this medicine, should, if possible, walk about the room; and there are instances in which several ounces, nay, half a pound, and upwards have been swallowed with the happiest effects. But, in the latter stages of obstinate and violent colics, when inflammation and gangrene have already taken place in the bowels, its specific gravity would infallibly rend the intestines, and accelerate the fatal crisis.

The general use of that excellent medicine *Calomel* renders its perfect preparation a matter of great importance. The following method to determine its purity is given by an able chemist, Mr. Frederick Accum.

"Calomel ought to be perfectly saturated with Mercury.

Complete saturation can *only* be known, by boiling for a few minutes, one part of calomel and 1-12th part muriate of ammoniac in 10 parts of distilled water. The fluid must then be filtrated and examined by means of carbonate of potash. If the calomel is well prepared, no change will take place on the addition of this re-agent: but if the preparation is imperfect, a precipitate will ensue, 47 parts of which indicate 48 of muriatic acid. 114 parts of calomel perfectly saturated with Mercury, contain 97 of metal and 17 of acid. It should be perfectly inodorous and tasteless, and when rubbed in a stone mortar with ammoniac, become intensely black."

Mercury within a few years has been extensively used as a medicine. It should never be trifled with; and during its exhibition, confinement to an equable temperature in a room, is indispensable. The best way to give it, is in small doses *regularly*, so that the effects may be gradually exerted on the system, and the impression once made should be carefully kept up as long as is necessary, to prevent much loss of time. The last disease in which mercury has been used with success, is consumption: and several cases of its happy exhibition are related by Dr. Rush in the *Medical Repository*, vol. 5.

Mercury, the Common English. See Perennial Goosefoot.

Mercury (Dog's). See Dog's mercury.

MERIDIAN, in astronomy, a great circle of the celestial sphere passing through the poles of the world, and also the zenith and nadir, crossing the equinoxial at right angles, and dividing the sphere into two equal parts, or hemispheres, the one eastern and the other western. In geography the meridian is a great circle passing through the poles of the earth, and any given place whose meridian it is, and it lies exactly under, or in the plane of the celestial meridian. These meridians are various, and change according to he longitude of places, so that their umber may be said to be infinite, for ll places from east to west have their neridians. The *first* meridian by the ncients was usually placed through the lace farthest to the west that was known. But modern geographers usually assume the meridian of the place where they live or the capital of their country, or its chief observatory, for a first meridian, and from thence reckon the longitude of places, east and west.

Meridian-*line*, an arch, or part of the meridian of the place terminated each way by the horizon. Or it is the intersection of the plane of the meridian of the place with the plane of the horizon, often called a north and south line, because its direction is from north to south. There are many methods of drawing a meridian line. The most simple is the following:

Simple way of determining the exact time of Moon, and to obtain a Meridian line, on a small scale.—Near the top of a room facing the south, fix a plate of metal with a circular hole in it, for the sun to shine through, from 8 or 9 o'clock in the morning until 3 or 4 o'clock in the afternoon, then, by means of a line and plummet, determine the point on the floor which is directly under the centre of the hole, and from that point, as a centre, draw several concentric semi-circles. Having made choice of some clear day near the summer solstice, make the room nearly dark, and about 3 or 4 hours before, and afternoon; mark the points where the northern, as also the southern limb of the sun's image cross those semi-circles, and there will be several curves included between these points, through the middle of which, a right line being drawn from the centre of the semi-circles, is a meredian line. After the line has been drawn in this manner, it must be examined by succeeding observations, and corrected, if necessary, by which means a line may be drawn exceedingly near the true meridian.

Practical observations on the above.—1. The metal plate, which may be about one-fifth of an inch thick, must be placed parallel to the axis of the world, that the sun's rays may pass perpendicularly through it when it is in the equator.

2. The aperture need not be more than one-fifth of an inch in diameter, if it be counter-sunk on both sides, to admit the sun's rays to flow through it at the distance of three or four hours before, and afternoon.

3. If the surface of the floor on which the observations are to be taken forfinding the meridian, be not sufficiently even, the floor may be covered with new boards, taking the greatest care that they are laid down perfectly horizontal from east to west. After the line has been correctly drawn, and the north and south ends of it marked upon the walls of the room, the boards may be taken away, and others laid down to draw the lines upon.

A meridian line, upon a small scale but sufficiently correct for regulating clocks and watches, may be had, by the following method:

Let a stone, with an even surface, about 3 feet long and 2 broad, be fixed horizontally upon a brick or stone pillar, at a convenient height, for observation, with one of its ends facing the south. Near the middle of this end of the stone fix a gnomon in a direction perpendicular to the horizon. This gnomon, which should be made of a strong bar of metal, must have a small aperture through it, for the sun's rays to flow through early in the morning and late in the evening. From that point, as a centre, which is directly under this aperture, draw several concentric semi-circles, and fix the meridian line according to the preceding directions. The gnomon should have several other holes made through it in a line perpendicular to the horizon, that the sun's rays at noon, flowing through some of them, may fall near the north end of the stone at all seasons of the year; for, if only one hole be used, the sun's image will fall near the centre of the gnomon in the summer, and in the winter it will be thrown far beyond the north end of the stone.

A Method of finding a true Meridian Line, useful in placing Horizontal Sun Dials, setting Clocks and Watches, &c.

Many gentlemen, not conversant in the science of Astronomy, purchase Horizontal Sun Dials, in order to set and regulate their clocks and watches by, but are totally at a loss how to fix the instrument in a correct manner. To such, the following method is recommended, as the most simple and practical, and will be quite sufficient to any person of the least mechanical abilities.

Let the plane of the pedestal on which the dial is to be fixed be made truly horizontal by a level; then from a point as near the middle as possible, describe three or four concentric circles, about a quarter of an inch asunder, making the outmost circle a little less than the plane of the pedestal. Fix a pin or wire perpendicularly in the centre, of such a height that its whole shadow may fall within the innermost circle for about two hours before and afternoon. The pin in thickness to be about an eighth part of an inch, with a round blunt point at the top. The pin may easily be known when perpendicular, by setting one point of a pair of compasses in several points of a circle, and extending the other to the top of the pin, if the same extent reaches the points in all the places, the pin is truly perpendicular. From about eight o'clock in the morning till four in the afternoon, about which hours the extremity of the pin's shadow will fall without all the circles, watch the times in the forenoon, when the extremity of the shortening shadow just touches the several circles, and *there* make marks. In the afternoon of the same day, watch the lengthening shadow, and where its end touches the circles in getting over them, make marks also. Lastly, with a pair of compasses find exactly the middle point between the two marks on any circle, and draw a line from the centre through that point, which will be the true *meridian*, or 12 o'clock line, and exactly over which that of the dial is to be placed.

Several circles are drawn, in case that at one time of the day it should be clear, and at another cloudy; and if therefore you should lose the time when the point of the shadow would touch one circle, you may certainly have it in another.

A CONCISE EQUATION TABLE,

Adapted to the Second Year after Leap-Year, and will be within a Minute of the Truth for every Year; shewing to the nearest full Minute, how much a Clock should be faster or slower than the Sun.

Months.	Days.	Equ. in Minutes.	Months.	Days.	Equ. in Minutes.	Months.	Days.	Equ. in Minutes.	Months.	Days.	Equ. in Minutes.
Jan.	1	4+	Apr.	1	4+	Aug.	9	5+		27	16—
	3	5		4	3		15	4	Nov.	15	15
	5	6		7	2		20	3		20	14
	7	7		11	1		24	2		24	13
	9	8		15	0		28	1		27	12
	12	9		☉			31	0		30	11
	15	10		19	1—		☉		Dec.	2	10
	18	11		24	2	Sept.	3	1—		5	9
	21	12		30	3		6	2		7	8
	25	13	May	13	4		9	3		9	7
	31	14		29	3		12	4		11	6
Feb.	10	15	June	5	2		15	5		13	5
	21	14		10	1		18	6		16	4
	27	13		15	0		21	7		18	3
Mar.	4	12		☉			24	8		20	2
	8	11		20	1+		27	9		22	1
	12	10		25	2		30	10		24	0
	15	9		29	3	Oct.	3	11		☉	
	19	8	July	5	4		6	12		26	1+
	22	7		11	5		10	13		28	2
	25	6		28	6		14	14		30	3
	28	5					19	15			

Those columns that are marked + shew that the clock or watch is faster than the Sun, and those marked — that it is slower.

MEROPS, the bee-eater, a genus of birds of the order Picæ, of which there are twenty-six species. The Merops apiaster, or common bee-eater, is found in many countries of Europe, but never in Great Britain. It is particularly fond of bees, but will eat various other insects; many of which it seizes like the swallow, on the wing. In the island of Candia, these birds are often taken by boys in the same manner as swallows, by a line, with an insect attached to a hook at the end of it.

MESENTERY, in animal economy, signifies that fat membrane, or membranous duplicature, which is situated in the middle of the abdomen, for preventing the intestines from entangling with each other, as they lie in a small compass. It is nearly of a circular figure, being about four inches in diameter, but from three to four yards in circumference, on account of its plaits or foldings. The bowels are tied like a border around the mesentery; as the former are from ten to twelve yards in length, according to the size of the individuals; so that to every inch of this circumference, there are fastened three inches of the latter.

This membrane is by Nature designed to support the intestines in their due place; to strengthen them; and to afford a situation to the milk-vessels (see Lacteals), glands, nerves, blood-vessels, &c. which are connected with the bowels. From its important use in the animal system, it may be easily conceived that the mesentery is liable to be affected with various diseases, the origin and seat of which are often neither suspected, nor clearly understood. It is, however, certain, that a disordered state of the *mesenteric glands* generally lays the foundation of the rickets, scrophula, wens, white swellings, and early consumption. Hence the injury done to infants, by *stuffing* them with superfluous or improper food; by allowing children promiscuously to eat cakes, gingerbread, and unripe fruit; all of which corrupt the Lymph (which see), and cannot fail to produce distressing maladies. One of the most fatal, however, is an *inflammation of the mesentery and its glands;* which, though difficult to ascertain, is not a rare occurrence: it is generally accompanied with costiveness, and always with a retention of urine: but seldom with violent fever or pain; and on examining the parts affected, there will appear a large swollen belly, and a deep-seated *tension* in the abdomen. Sometimes blood and fetid matter are discharged by stool: and it is remarkable that male children are more frequently subject to it than those of the female sex; and that the disorder, unlike other inflammations, may prey on the little patient for weeks, before it be discovered; though in acute cases, it proves suddenly fatal.

Cure. As soon as the nature of this dangerous affection is ascertained, leeches ought to be applied to the lower belly, and a large blister to the small of the back. Emollient clysters, fomentations made of an infusion of chamomile flowers, with the addition of laudanum; and the tepid bath, will also be of essential service.

The patient's *regimen* and *diet* should be similar to that stated under article Inflammatory Fever: he may likewise drink sweet whey with honey, or equal parts of Seltzer water and milk. With a view to check a debilitating looseness, he ought to take decoctions of the salep-root, sago, tapioca, &c.

METAL, in natural history and chemistry, the name of a class of simple bodies, of which it is observed that they possess a lustre; that they are opaque; that they are fusible, or may be melted; that their specific gravity is greater than that of any other bodies yet discovered; that they are better conductors of electricity than any other body; that they are malleable, or capable of being extended and flattened by the hammer; and that they are ductile or tenacious, that is, capable of being drawn out into threads or wires.

All metals have a greater or less aptness to imbibe oxygen; and this is the cause of the production of what is commonly called *tarnish*, or *rust*, or calx; but which modern chemists denominated *oxyde*. This substance is always a compound of metal and oxygen. The common brown oxyde of iron is well known; and the fine blue colour upon the surface of steel is also an oxyde artificially procured: that is, by heating the metal, which disposes it to imbibe the oxygen of the atmosphere. At present the number of metals amounts to 21; they are sometimes divided into perfect, imperfect, and semi-metals. But this distinction being pretty well exploded, they are more conveniently arranged under three classes, viz. 1. Metals which are malleable. 2. Such as are brittle and easily fusible. 3. Those that are brittle and fusible with difficulty.

Malleable Metals.—Platinum, hitherto found only in South America, heavier than gold, white, extremely tenacious, very ductile and malleable, fusible by a strong heat. It is always found in small scales, in a metallic state, and combined with iron.

Gold, of a yellow colour, found in many parts of the globe, sometimes pure, or mixed with a small proportion of silver, copper, or iron, but most commonly disseminated through the veins of other metals. It surpasses every other substance in ductility and malleability. An ounce of gold-leaf upon silver-wire is capable of being extended more than 1300 miles in length.

Silver, next to gold and platinum, the most perfect, fixed, and ductile of all metals, harder and more sonorous than gold, and fusible with a less degree of heat. It may be beat into leaves $\frac{1}{160000}$th inch thick, and a grain of it may be drawn out into wire 400 feet in length. It is found in quartz, lime-stone, hornstone, or combined with the ores of other metals.

Mercury, or quicksilver, of a white brilliant colour, fluid at the common temperature of the atmosphere. It abounds in Europe, South America, China, and occurs most commonly in schistus, lime-stone, and sand-stone.

Copper, the hardest and most elastic of metals, except iron; commonly found in rocks of hornblende, schistus, and quartz. It is considerably ductile, malleable, sonorous, fusible, and destructible by fire. Native copper occurs sometimes in masses, sometimes in plates of various forms, and sometimes crystallised in cubes. It is the basis of several metals, as brass, bell-metal, prince's metal, white copper, &c.

Iron, the hardest, most abundant, and most useful of all metals. Its properties are well known, viz. hard, fusible, malleable, combustible, and magnetic.

Tin, the brightest of malleable metals, and least ductile, except lead. It is of a white colour and a disagreeable taste, soft, easily fusible, elastic, and sonorous. The only tin mines in Europe are those of Cornwall, Devonshire, Saxony, Bohemia, Silesia, Hungary, Gallicia. Bell-metal is three parts copper and one of tin.

Lead, a pale metal, soft, flexible, not ductile nor sonorous in any considerable degree, malleable, fusible, and capable of combining with most of the metals. By means of heat it is formed into red lead, and by the steams of vinegar into white lead. Pewter is composed of three parts of tin and one of lead.

Nickel, of a white colour, softer than iron, rendered brittle by heat, malleable when cold, and like iron attracted by the magnet. It has been hitherto found in small quantities in Britain, France, Germany, &c. and commonly accompanies cobalt.

Zinc, when pure, of a brilliant white colour, composed of a number of thin plates adhering together. It is fusible, but not ductile, nor so malleable as the metals already mentioned. It generally accompanies lead ores. Three parts of copper and one of zinc form *brass*. Three parts of zinc and four of copper form pinchbeck, or prince's metal.

Brittle and easily fusible Metals.—Bismuth, composed of broad brilliant plates of a yellowish colour adhering to each other. It is fusible, but not ductile, and loses its lustre when exposed to the air. It combines with almost all the metals, often accompanies cobalt, and is found in England, Germany, France, Sweden, &c. Dissolved in nitrous acid, it forms a paint called pearl white.

Antimony, a ponderous brittle mineral of laminated texture, and a greyish white colour, fusible, and easily reduced to a fine powder. It combines with most metals; and is found abundantly in many countries of Europe. Sixteen parts of lead and one of antimony form an alloy for printers' types.

Tellurium, a metal of a bluish white colour, intermediate between zinc and lead, brilliant, fusible, easliy reduced to powder, and the most volatile of all the metals, except mercury and arsenic. It is found in Transylvania.

Arsenic, a brittle compact substance of a blueish white colour, volatile, and extremely combustible. It has a sharp acrid taste, when heated it emits a strong odour of garlic, and is a most virulent poison. It combines with most metals, rendering them more brittle and fusible.

Metals brittle and fusible with difficulty.—Cobalt, a heavy and grey coloured mineral, almost without taste or smell, brittle, and easily reduced to powder, attracted by the magnet, somewhat malleable when hot, fusible, and capable of combining with most metals.

Manganese, a very hard, brittle, dark grey, or brown, mineral, of a granular texture, with a good deal of brilliancy, and fusible by an intense heat. It combines with many of the metals: when reduced to a powder it is attracted by the magnet, and has been long known and used in the manufacture of glass.

Tungsten, that is, ponderous stone,

found in Sweden, one of the hardest of metals, of an opaque white colour, brittle, fusible, not attracted by the magnet.

Molybdenum, composed of scaly particles adhering slightly together, of a colour resembling lead, and almost infusible.

Uranium, found in Saxony, of a dark grey colour inclining to brown, opaque, tolerably hard, fusible by a strong heat. On being pounded it yields a black powder. Nothing is known concerning its malleability or alloys.

Titanium, found in Cornwall, of an orange red colour, with a good deal of lustre, but not fusible by any heat that can be produced. Neither its hardness nor malleability has been ascertained.

Chromium, found near Ekaterimbourg in Siberia, brittle, of a white colour, with a shade of yellow. It is fused with difficulty; but few of its properties are known.

Metal, *Bell*, see Bronze.

Metal, *Prince's*, see Zinc.

METALLIC, POINTED SUBSTANCES, are often inadvertently swallowed by children and adults; in such cases it will be necessary to take large draughts of vinegar, lemon-juice, or other vegetable acids, in order to blunt the points of iron, brass, copper, and other fragments or pins; but never to venture on an emetic. If the metallic bodies introduced by the mouth, have been of a round form, or if they happen to be detained within the Gullet, we refer the reader to that article.

METALLURGY, the art of working metals, particularly as fusible bodies; comprehending that of *smelting*, or fluxing the metal from the state of the ore.

METEOR, in natural history, a transitory body, or appearance of a body, appearing in the atmosphere, and caused by the action of the electric fluid upon other matters. Under the denomination of meteors are comprehended lightning, winds, rains, &c.

METEOROLOGY, is the science of studying the phenomena of the atmosphere. These phenomena may be classed under five distinct heads, viz. the alterations that occur in the weight of the atmosphere: those that take place in its temperature: the changes produced in its quantity by evaporation, and rain, and those which arise from electric and other causes. The majority of meteorological alterations depends on chemical changes and combinations, and if we were accurately acquainted with the peculiarities of the substances which form the component parts of the atmosphere, nothing would be more easy than to explain the result of their mutual action, but this not being the case we must be contented with probabilities. See Rain; Weather, *rules for judging of*; Wind; &c.

METEORS, or fire balls, have been frequently observed in the atmosphere. The elevation of some of these bodies above the earth is astonishingly great, their motion extremely rapid, and their diameter in some instances exceeding 1,000 yards. Dr. Halley, in March 1719, observed a remarkable one, whose height he computed to have been about 70 miles, its diameter more than 1½ mile, and its velocity about 350 miles in a minute. Another appeared in August 1783, whose diameter was at least equal to that of the former, whose velocity was 1000 miles in a minute, and its height above the earth not less than 90 miles. These bodies generally disappear on a sudden, and with a loud noise. Heavy stony masses, composed of the same ingredient, resembling each other, and differing completely from every other stone, are said to fall to the earth at the time of the explosion. Many well authenticated instances of the falling of such stony substances have been recorded. When discovered soon after their fall, they are always hot, and buried to some depth under ground. Their size varies from a few ounces to several tons; and in many cases they smell strongly of sulphur. The outer surface is a rough black crust, chiefly of oxyde of iron; the interior part is composed of four substances, viz. small spherical bodies of greyish brown colour, fragments of a peculiar pyrites, grains of iron, and a grey cement of an earthy composition. These masses are probably concretions formed in the atmosphere; but concerning the manner in which they are composed, and the splendour of their appearance in a region where the air is 300,000 times rarer than the air near the earth's surface, we presume not to offer a conjecture.

MEZEREON, Spurge-olive, Spurge-flax, or Dwarf-bay, *Daphne Mezereum*, L. an indigenous lowshrub, growing in woods and shady places, and flowering in the month of February or March. When cultivated in gardens, it attains, in a rich soil, the height of sixteen feet.

The whole of this plant is so corrosive, that six of its berries are said to be sufficient to kill a wolf. An ointprepared from its bark or berries, has been advantageously applied to foul or ill-conditioned ulcers. When chewed, its root occasions ulcerations, and considerable irritation in the throat; but is very serviceable in removing difficulty of swallowing; and Dr. Withering (*Botanical Arrangement*, vol. ii. p. 377,) states, that a woman who had been unable to swallow any solids, and liquids very imperfectly, for three years before, was effectually cured in two months, and enabled to take any food without difficulty, by chewing a thing slice of the root of mezereon, as often as she could support its irritating effects. On sudden emergencies, the root of the Spurge-olive, scraped and applied to the surface of the skin, affords an efficacious substitute for the Spanish-fly, as a blister which speedily operates:—It may also be applied in the form of issues.

Dambourney obtained from the stalks and leaves of the mezereon, a fine *vigogne* dye; and the stalks alone imparted a beautiful gold-brown shade to wool, previously dipped in a diluted olution of bismuth. From the ripe berries of this plant, an excellent red lake is prepared by painters.

MEZZOTINTO, a manner of representing figures on copper, so as to form prints, in imitation of shadowing in Indian ink. Take a well-polished copper-plate, and beginning at the corner, rake or furrow the surface all over with a knife, or instrument made for the purpose, first one way, and then the other, till the whole is of a regular roughness, without the least smooth part to be seen; in which state if a paper were to be worked off from it at the copper-plate press it would be black all over. When this is done, the plate is rubbed with charcoal, black-chalk, or black-lead, and then the design is drawn with white chalk; after which the out-lines and deepest shades are not scraped at all, the next shades are scraped but little, the next more, and so on, till the shades gradually falling off, leave the paper white, in which places the plate is perfectly burnished. By an artificial disposition of the shades, and different parts of a figure on different plates, mezzotintos are printed in colours, so as to represent actual paintings.

MICA, Muscovy-glass, Glimmer, a genus of magnesian earths, of which there are two species: viz.

1. The *colorata martialis*, coloured martial glimmer, of which there are many varieties, distinguished by their brown, black, semi-transparent blue, and green shades: they are found chiefly in Lapland, Sweden, and other northern parts of Europe.

2. The *alba*, pure or colourless mica, which contains several varieties, that are found in Siberia and Sweden, and are perfectly transparent; whence it has obtained the name of Muscovy-glass.

Both species consist of thin glittering pieces, that are divisible into leaves, or plates: which when exposed to a moderate heat become brittle; but if placed in a strong furnace, they curl or crumple, and are with difficulty reducible into glass. Mica, however, melts easily with borax, by the aid of which it may be converted into glass, with a blow-pipe.

The broad and colourless mica is used in Russia, as a substitute for glass, to which it is preferable: because it resists the shock on the explosion of a cannon.

This broad colourless mica, is found in large quantities in New-Hampshire, and has been used in Philadelphia for lanthorns, for which it answers very well. For magazine or ship lanthorns it is peculiarly valuable, as no danger will attend the falling of a candle against the side.

MICROMETER, an astronomical machine, which, by means of a screw, serves to measure extremely small distances in the heavens.

MICROSCOPE, an optical instrument, consisting of lenses or mirrors, by means of which, small objects appear of a larger size, than they naturally are to the naked eye.

This valuable instrument, though not entirely unknown to the ancients, was re-invented and made public in the early part of the 17th century: it has, since that period, received continual improvements from various ingenious philosophers and artists, among whom the names of Leeuwenhoek, Wilson, Hook, the Adams's, Lieberkuhn, Barker, Grey, Martin, Dr Torre, and Smith, deserve to be gratefully recorded.

Microscopes are of two sorts, *single* and *double*. The former consist in general of one lens or mirror: but, if a greater number be employed, they only serve to throw additional light upon the object, without farther enlarging its image. Double or compound microscopes are those in which the image of an object is composed of several lenses or mirrors.

The utility of microscopes is very extensive, both to the naturalist and the artist: hence the invention of them must be regarded as one of the greatest efforts of human ingenuity. It is true, they do not contribute in any essential manner to the happiness of mankind; but they serve to unfold the wonders of Nature, and thus insensibly raise the mind to the contemplation of that Great Being, whose works, however minute and apparently insignificant, uniformly evince the highest skill and most perfect symmetry.

MIDWIFERY, or the obstetrical art, a branch of medicine which requires no farther definition. In most countries of Europe, and in other parts of the globe, it is practised by women; for it comprehends their management both before and after delivery, as well as the treatment of the child during the earliest period of life.

MILDEW, or *Erisyphile*, a disease of plants, consisting of a thick, clammy, sweetish juice, that is supposed to exhale from, or descend on, the leaves and blossoms of vegetables.

The mildew occurs most frequently on wheat, hops, the dead nettle, maple, and the gromwell. It sometimes rests on vegetables in the form of a fatty juice; which, being naturally tough and viscous, acquires these properties in a still greater degree, in consequence of its finer and more fluid parts being exhaled by the sun; so that the plants affected by it, cannot perform the important office of perspiration, and thus never attain to maturity.

According to Dr. Darwin, the mildew is a plant of the fungus kind, which vegetates without light or change, or air, in the same manner as the generality of mushrooms; and penetrates with its roots the vessels to which it adheres. He suspects, however, the plants affected, to have been previously injured by internal disease; and directs them to be thinned; or to remove those which are contiguous to the disease, in order to admit more light, and greater ventilation: thus the mildew may be remedied, and the plant at the same time restored to its former vigour.

Common wheat is more subject to this destructive disease than that which is bearded, *especially if the land be newly dunged*. As, however, it is highly probable, that the greater dampness of some soils, together with their being over-shadowed by too thick foliage, affords one *permanent* cause of mildew, Dr. Darwin recommends the land to be properly drained; the ashes of coals, bones, or other drier manures, to be employed; and likewise to *thin* the crops. And, as this *mucor* particularly affects late crops, he is further of opinion, that the seed should be sown early in the season; by which means the mildew will not only be prevented, but a forward crop will be obtained.

Where this disease has already infested the plants, a brisk shower of rain, succeeded by a smart wind, is believed to be the most efficacious remedy, to prevent its farther progress. If the mildew be observed before the sun rises to its meridian power, it will be advisable to send two men into the field, furnished with a long cord, of which each should hold one end: by dexterously drawing this rope over the ears of corn, the dew will be removed, before the heat of the sun dries and reduces it that viscous state, in which it obstructs the perspiration of plants. Lastly, it has been confidently asserted, that lands, which have been affected with the mildew for several successive years, have been effectually cured by sowing *soot*, either together with, or immediately after corn; and that hop-plantations may be secured from its injurious effects, by manuring them with hogs'-dung.

M. Seger, in his valuable German *Treatise on the Mildew, considered as the principal cause of Epidemic Diseases among Cattle*, &c. (published at Vienna in 1775) observes, that the mildew is so sharp and corrosive, as to raise blisters on the feet of shepherds who go with naked feet; and that it even consumes the hoofs of cattle. He supposes it to be a kind of rust, and to possess some arsenical properties. Its pernicious influence is rendered still more powerful by a variety of circumstances; such as sending cattle into the fields too early in the spring; suffering them to drink water mixed with ice; or keeping them in close, filthy stables, that are not sufficiently aired.

M. Seger likewise conceives the *mildew* to be a principal cause of epidemic diseases in cattle. The particular species, producing such distempers, is that which burns the grass and leaves. It falls usually in the morning, especially after a thunder-storm; and its poisonous properties (which do not continue above twenty-four hours) never operate unless the mildew be swallowed immediately after it has fallen. The disease first affects the stomach, and is accompanied with pimples on the tongue, loss of appetite, a cough, and great difficulty of respiration. As a preservative, the ingenious author directs cattle to be well purged, both in the spring and in winter; for which purpose he prescribes half a drachm of sulphur of antimony, and a whole drachm of resin of jalap, for one dose: he concludes with cautioning the proprietors of cattle, carefully to avoid the use of emetics, and every thing that is of a heating nature; because such treatment would be productive of fatal consequences.

The Rev. Dr. **Edmund Cartwright**, of London, whose experience in agricultural matters is well known, recommends the following new remedy for mildew in wheat.

"In the course of some agricultural experiments which I was prosecuting last summer, I had the good fortune to make a discovery of more importance to agriculture than any thing, I may venture to say, that has been brought forward for the improvement of that most useful of all arts. The pecuniary benefits which it will confer, both on the growers of wheat, and on every individual consumer of that article, I presume not to calculate. It is an absolute remedy for the mildew in wheat. It is simply this: salt one part, water eight; with this mixture let the diseased corn be sprinkled; in 3 or 4 days the mildew will vanish, leaving only a discoloration on the straw, where it had dried off; in the experiment which I tried, the mixture was laid on with a watering pot—but I have since found out, that the best and most expeditious way will be with a flat brush, such as used by the white-washers, having a tin collar made water tight, to prevent the mixture from dripping down the operator's arm, and running to waste. The operator having a pail of the mixture in the one hand, with the other dips the brush into it, and makes his regular casts, as when sowing corn broad-cast; in this way he will readily get over ten acres in the day: if he has an assistant to fetch and carry the full and empty pails, he will get over a great deal more. I calculate, that about two hogsheads of the mixture will suffice for an acre. Wherever the mixture touches, the mildew immediately dies. I need not say, that on those parts that have escaped, the sprinkling must be repeated. If judiciously cast, the mixture falls as uniformly as a shower of rain. Many people have an idea, that the mildew is to be prevented by particular steeps or manures, but this idea is totally unfounded.

The mildew is a topical disease, which is only to be subdued by a topical remedy."

MILE, *mille passus*, a measure of length containing eight *furlongs*, or 1760 yards: this is the English *mile*. It is different in different countries: thus, the

	Yards.
Mile of Russia - -	1100
———Italy - - -	1467
———Scotland and Ireland	2200
———Poland - -	4400
———Spain - -	5028
———Germany - -	5866
———Sweden and Denmark	7233
———Hungary - -	8800

Milfoil. See Common Yarrow.

MILIARY FEVER, or *Miliaria*, a disease which affects both sexes, at every age, but particularly recluse and sedentary women. It is accompanied with continued fever, anxiety, a sensation of punctures in the skin, and profuse unctuous sweats.

Causes.—Excessive watching; the indulgence of the more violent passions; suppressions of the natural discharges, as also too great evacuations; eating of unripe fruit, and similar pernicious trash; a weak watery diet, and impure or putrid water. It is, in general, a primary disease, though it is sometimes consequent on quartan and puerperal fevers.

Peculiarities.—The miliary fever, though not contagious, is an epidemic disease, and sometimes a *critical* symptom in the autumnal putrid fever. It generally commences its attack with a cold shivering, which is succeeded by intense heat, pain in the head and loins, oppression on the breast, and difficulty of breathing. An itching and prickling sensation is felt in the skin, which, between the seventh and fourteenth days, is covered with numerous small, red, and distinct pimples, that appear first on the neck and chest, and gradually spread over the whole body, excepting the face. This eruption is usually preceded by profuse sweating; and, in the course of two or three days, the tops of the pimples are filled with small white vesicles, which speedily disappear. In the course of a few days, the pustules assume a yellowish cast, and at length totally vanish, leaving the skin covered with branny or mealy scales.

Cure.—In this, as in all other eruptive fevers, the chief point is, to prevent the pustules from *striking inwards;* as the patient is then in the most imminent danger. In the first period of the disease, blood-letting will, in general, be necessary; and, if the eruption appear and disappear, repeated small blisters may be advantageously applied. It will likewise be advisable to administer, frequently, gentle laxatives; but, if the patient be in a languid state, and the bowels become regular, the liberal use of Peruvian bark will essentially contribute to his recovery. During the whole progress of this fever, he ought to be kept uniformly cool; his diet also should be cooling and nutritious, and adapted to his strength and constitution. Lastly, as soon as he is able to encounter the air, gentle and daily exercise will be attended with the best effects.

MILK, a well-known, nutritious fluid, with which Nature has wisely furnished the breasts of females, and the udders of animals, for the support of their young.

Milk consists of three parts, namely, *caseous, butyrous,* and *serous.* The first comprehends the grosser earthy particles, which serve to suspend the butyrous part; and which, when coagulated by art, are formed into CHEESE. The second ingredient comprises the *butyraceous* or oily particles, or cream, which float on the surface of milk, and are by agitation converted into BUTTER. The *serous* are the more watery parts, constituting what is called whey, and serving as a vehicle for the two before stated. The most wholesome milk is that which contains a due proportion of the three constituent parts.

Having already discussed the qualities, as well as the methods of preparing BUTTER, BUTTERMILK, and CHEESE, under those respective heads, we shall briefly consider the properties of milk, afforded by different animals, as an article of food.

The milk of women, mares, and asses, nearly agree in their qualities, being very dilute, sweet, though acescent, and, when coagulated, easily *broken down.* That of cows, goats, and sheep, possess properties widely different, of these, cows' milk approaches nearest to that yielded by the female breast. But the milk obtained from goats, is of a peculiar nature; as its oily and coagulable parts do not separate spontaneously, throw up no cream, and yield no butter. That of sheep is rich and nourishing; produces abundance of butter, but which is so unpalatable as to render it unfit to be eaten. Both these fluids afford a large proportion of strong and tough cheese.

Cows' milk forms a very essential part of human sustenance, being adapted to every state and age of the body, but particularly to infants, after being weaned. It should, therefore, be drawn from sound, young, and healthy animals: as it is most nutritious, when these are between three and four years old. Good milk is perfectly white, and totally divested of smell. As, however, it contains a great portion of the fatty or oily particles, known under the name of cream, it ought always to be diluted with water, before it is given to children. But to scorbutic persons, or those troubled with inveterate ulcers, it will be found of great benefit, in a pure, undiluted state; as it combines both saccharine and oleaginous particles.

From its balsamic nature, milk promotes the different evacuations, especially insensible perspiration; in a *serous* or diluted state, it has often afforded considerable relief in obstinate coughs; in disorders induced by worms, hysterics, the putrid sore-throat, the gout and stone, and various other diseases, with which mankind are afflicted. But if a person be debilitated, or otherwise exhausted by sickness, milk ought by no means to be used; as it is apt to generate cramps or violent spasms in the stomach, the heart-burn, &c. Corpulent and plethoric persons; those who are recovering from febrile complaints: and particularly such as are accustomed to drink wine, and spiritous liquors, cannot with advantage or safety adopt a *milk-diet;* because the fatty and viscid properties of that fluid tend to oppress the stomach, and occasion indigestion. When milk is used *medicinally,* it ought to be taken as speedily as possible after it has been drawn from the cow; for its most nourishing and attenuating particles exhale, if it be boiled, or even for a short time exposed to the air.

Lastly, if milk be suffered to become *sour,* it cannot be easily digested: and, though it is in that state unfit to serve as an article of beverage, its utility does not cease. There is a liquor, distilled from acid milk, butter-milk, or whey, which is asserted to be a valuable menstruum in the preparation of colours.

Milk being of such extensive utility,

both as food and medicine, our readers will probably expect some account of such vegetables as are calculated to increase the quantity of that sweet and wholesome fluid. One of the most effectual methods, consists in giving cows, every morning, decoctions of the richest and most fragrant species of clover, and especially of *lucern*. This subject has already been concisely discussed under the article CATTLE; and, as we state the *lactiferous* plants in their alphabetical order, it would be superfluous to repeat them in this place. But we cannot omit to animadvert on the culpable filthiness in which cows are confined, both in the metropolis, and in its vicinity, where these useful animals are literally *crammed*, not with wholesome food, but with such matters as are calculated to produce an abundance of milk. This unnatural practice, however, would in some degree be *venial*, if that milk were vended in a *pure* state. It is, indeed, a notorious fact, which we think our duty to state, that vessels both of hot and cold water, are always kept in the cow or milk-houses, for the accommodation of mercenary retailers. These persons purchase a certain quantity of *unadulterated* milk, and at a low price; but, as each must make his or her profit, they mix with it such a proportion of water as they may think necessary to make their milk of a *sufficient standard*; when it is hawked about at the present exhorbitant price. Circumstances of this fraudulent complexion ought to be more generally known; and we trust that the vigilance of the police will soon be extended to the suppression of practices and abuses, equally bold and iniquitous.

Skimmed milk, is that which remains after the cream has been taken off its surface. It is often sold for new milk, and employed in considerable quantities by wine-merchants, for the purpose of clarifying, or fining down turbid *white* wines, arrack and weak spirits; but it should not be used for *red* wines, as it discharges their colour.—This kind of milk is also useful for *whitening* such wines, as have acquired a brown tint, either from the cask, or in consequence of having been boiled, before they have undergone the vinous fermentation. In such cases, a little skimmed milk precipitates the colour, leaving the wine almost limpid, and of a pleasant flavour.—A fluid of such harmless nature is in every respect preferable to the noxious matters, with which avaricious vintners, poison their turbid or damaged wines.

THE MILK OF THE FEMALE BREASTS is frequently very troublesome to delicate women, and subjects them to many disorders. The more common of these are:

1. Deficiency of this nourishing fluid, which is often occasioned by the indulgence of anger, or other passion; worms; or intestinal complaints. Those who are advanced in years, before they become mothers, are particularly liable to this complaint, which is likewise induced by poor aliment, or some constitutional defect in the fluids. If the latter cause be obvious, it will be advisable to administer absorbent powders; but, if it originate from parsimonious living, the patient's diet ought to consist of rich cow's milk, and light nourishing food. Should, however, such deficiency be *absolute* and the breasts be totally devoid of this salutary fluid, the only method of preserving the infant's life will be, to procure a careful, healthy, wet-nurse.

2. Excess, or evident abundance of milk, occurs as frequently as the contrary; and requires the greatest attention: for, otherwise, inflammation and abscesses in the breast may be the consequence. Hence the patient should live sparingly, and suckle two infants, with a view to diminish the too rapid flow of milk.

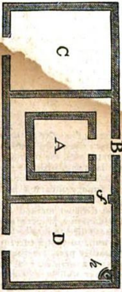
3. The *Milk-fever*, one of the most alarming diseases of females, is sometimes occasioned by terror, taking cold, &c. though it is more frequently induced from a false principle of delicacy, by neglecting to put the infant to the breast. It occurs, in general, a few days after delivery, and requires to be treated with the utmost precaution. To check its progress, it will be necessary to resort to camphorated clysters, gentle evacuations, and embrocations of linseed and similar emollient oils. The infant ought likewise, to be put frequently to the breast; and, if no relief be thus obtained, they should be drawn, either by means of the small air-pump, or some expert person. The patient's diet ought to be light and cooling; but, if the fever prove violent, and be accompanied with putrid symptoms, it will be advisable to administer Peruvian bark liberally, and to obviate costiveness, by gentle laxatives. One of the most effectual preventives of this

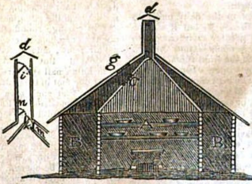
fever is, to place the infant to the breast as early as possible; a practice which cannot be too strongly recommended; as the life, or at least the health, of many valuable mothers might be spared, if such method were more generally followed. The apartment ought to be carefully aired; and, if the breasts abound with milk, at the commencement of the fever, they should be occasionally drawn; thus, that fluid might effectually be prevented from acquiring an unnatural acrimony, or from being absorbed, while in a corrupted state.

Violent passions and affections of the mind must be studiously avoided by those who suckle children; for such irregularities not only lay the foundation of the most painful disorders in mothers or nurses, but also injure the innocent babes, by inducing painful, and often fatal diarrhœas. In every instance, after sudden fright, or a fit of passion, it will be advisable to squeeze, or gently agitate the breasts, in order to discharge the redundant milk, before the infant be permitted to suck. Lastly, if the breasts become turgid, and there be an apprehension of the milk coagulating in them, shortly after parturition, it will be requisite to present them to the infant; provided it be sufficiently strong: in the contrary case, another child or adult should draw them, and thus diminish the superfluous and hurtful part.

MILK-HOUSE, a building designed for the reception and preservation of milk, previously to its undergoing the various processes of the dairy.

As we have already, under the head of DAIRY-HOUSE, treated of the utensils, &c. proper for the management of milk, we shall now lay before our readers a cut, representing a milk-house, upon an improved plan, by the industrious Dr. ANDERSON.





Description of Dr. **Anderson's** Milk-house, *with its appurtenances.*

The uppermost of the three figures represents a section of the whole structure.

A, the dairy in the centre, surrounded by open passages.

B, the entry to the dairy from the north.

C, the ice-house.

D, the scullery, or wash-house, with the door or entrance from the south, and benches placed beneath.

f, a door which communicates with the milk-house, &c.

h, the fire-place.

The lowermost of the three figures, is an elevation of the milk-house A.

B B, the passages round it.

c, the interior window.

d, the ventilator or air-pipe.

g, the exterior window.

The smallest of the figures above given, is a delineation of the ventilator.

i, represents the valve at the top.

k, another valve at the bottom, which communicates with the milk-house.

n, a similar valve, with the passage.

The whole of this structure ought to consist of a range of narrow buildings, as in the section first delineated, where the middle division marked A, represents the *milk-house*, properly so called. Dr. **Anderson** directs it to be built with a double wall, so that a current of air may continually pass, for the purpose of preserving a regular, cool temperature; the inner wall being constructed with lath or bricks, doubly plastered on both sides; and the outer one, consisting of plaistered lath: both being carefully worked, so as to render them perfectly air-tight.

The entrance to the dairy ought to be on the north side B; but it will be requisite, for greater convenience, to make another communication through the door *f*, into the front room, especially during the winter, when the outer door B, should be kept continually shut. The external roof ought to be constructed with tiles, or slate, while the inner one should be made of plaister, closely applied. Between both, it will be necessary to leave a vacant space, at least four feet wide, for the free passage of air, as delineated in the elevation above given; in which the letter A. represents the inside of the *milk-house*. The letters B B, designate the area between the two walls, that gradually diminishes towards the top, till it terminates in the ventilator or wooden chimney *d*; which ought to be constructed, on three sides, with planks or boards lined with plaister: the fourth, or south front, should consist wholly of glass, carefully closed with putty, so as to render it completely air-tight. Its dimensions may vary at pleasure, from one to two feet in diameter, internally; but it should be elevated at least six or eight feet above the roof; as its effects will be more or less powerful, according to its length.

This tube is furnished at the top with a valve *i*, placed immediately beneath the air-holes, which may be closed when required; and at the bottom is a similar valve *k*. The lower pipe, which communicates with the milk-house, is considerably smaller than the upper tube just described. The opening *m*, is closed on one side; and at *n* is a valve, which, when shut, prevents any communication between this pipe and the external area.—Farther, the top of the ventilator is covered with boards, placed in the form of a roof, so that the rain may be thrown off, without impeding the current of air; while, by means of the valves above-mentioned, the air, heated by the action of the sun through the outer wall, will immediately escape, thus constantly preserving a due temperature; and, by the same means, all damp and confined air, which is extremely pernicious in dairies, will be constantly expelled.

The building is furnished with a window placed along the slanting interior roof at *c*, and which is closed down with putty, to prevent it from being opened. Another window, *g*, is fixed over it in a similar manner on the external roof, so as to transmit the light without impeding the current of air between the two glasses.

The passage round the milk-house ought to communicate with the external air below, only at the threshold of the door B. But it will be necessary to make a small aperture on every side, about one foot in height from the floor, in order that such area may be occasionally ventilated. Each of these apertures should be secured with a piece of thin wire-work, in order to prevent the approach of insects, or other vermin; and ought likewise to be furnished with a door, or cover, by which it may be opened, or closed, according to circumstances. Farther, if this passage be furnished with shelves, and lighted by a glazed window from the inner apartment, so as to admit *light only*, it may be advantageously converted into a pantry for keeping butter, cheese, &c. perfectly cool, independently of its use for preserving the temperature of the milk-room.

The whole of the interior apartment should be furnished with hard plaister neatly smoothened, and totally devoid of ornament, so that it may be cleaned as often as becomes necessary. In its centre, Dr. ANDERSON directs a large stone table to be placed, being about 2½ feet high, 3 feet wide at the least, and of a breadth proportioned to the length of the room. Beneath the table is to be fixed a stone trough, corresponding to the length and breadth of the former, and being about one foot deep, that is, six inches above and below the floor of the milk-house. From the bottom of the trough, a pipe is to be conducted, for the purpose of carrying off the water: and, in case it be supplied by a running stream, it will be requisite to make one side of such trough somewhat lower, that the water may run over, and thus be carried out of the house. The floor of the building should be constructed with stones neatly laid; and, if these be easily attainable, the shelves, delineated in the elevation above given, should be hewn out of the same materials: otherwise, they may consist of wooden planks.

If the milk-house be situated near a large town, were ice could be vended during the summer, Dr. ANDERSON is of opinion, that it would be very beneficial to the owner to erect an ice-house contiguous to this dairy, as represented at the letter C, in the uppermost cut above given. He recommends it to be surrounded by a double wall on three sides, with a passage or area intervening, as in the dairy. The receptacle for the ice ought to be formed of upright posts, lined with wattled-work of wands, or with close rail-work, but so as to leave a walk two feet and a half wide every way; round which a gutter should be made to carry off such water as may drain from the ice. This is, in his opinion, the cheapest method of building an ice-house, in any situation; and is far preferable to the usual mode of making vaults, which are not only more liable to be damp, and become mouldy, but are also far more expensive, and by no means so well calculated to preserve a gentle coolness, and an equal temperature, at every season.

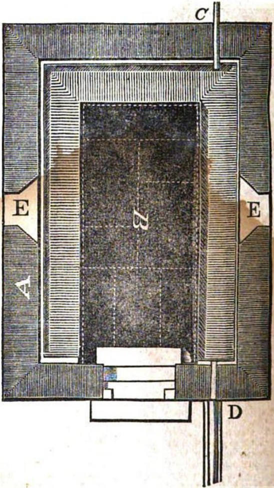
The apartment, marked with the letter D, is designed as a repository for the utensils of the dairy, in which they may be cleaned and arranged. For this purpose, it will be advisable to place shelves round the walls, together with tables, and such other articles as may be found necessary. Its entrance should be from the south, where the roof projects about two feet over the wall, as at *f*, which door communicates immediately with the milk-house, and may be occasionally opened in the summer; but which alone ought to be used during the winter, when the chief entrance B, should be constantly shut. At one end of this apartment is a fire-place, on which a cauldron, proportioned to the size of the dairy, ought to be fixed; in order that there may be a continual supply of warm or hot water.

Such is the outline of Dr. ANDERSON's ingenious plan, which appears to be well calculated to enable attentive dairymen, to keep their milk of an equal temperature at all seasons, while they may, at the same time, carry on the necessary operations with little trouble or expense. Those of our readers, who wish to become more intimately acquainted with the whole economy of the milk-house, will not, without instruction, peruse Dr. ANDERSON's *Practical Remarks on the Management of the Dairy*, which were originally published in the 5th vol. of the *Letters and Papers of the Bath Society*; but which have been considerably enlarged in the 3d vol. of the new series of his valuable miscellany, entitled *Recreations in Agriculture, &c.*

The following cut (Fig. 1) represents the ground plan of a milk-house, at the farm of Mr. J. MILLER, Chester county, a plate of whose excellent barn was given under the article FARM-YARD.

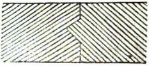
The trough A, surrounds the platform B, and both are made of rubbed marble slabs, set in Tarras cement; and the joints *well joggled:* the water is admitted by a leaden pipe C, which is inserted three inches below the nozzle of a pump near the house. The pipe at D, is level with the platform, and conducts the water off when is rises as high as the platform; thus affording a continual change of water: The milk stands about two feet six inches below the surface. The platform is five feet wide: the deepest part of the trough is six inches, and the shallowest four inches. The trough extends thirty-five feet round the platform, and is one foot eight inches wide. There are two small opposite windows in the house, E E, a little above the surface. The scale of the cut is ⅛ of an inch to a foot.

Figure 1.



By *joggling*, is meant the leaving a ridge on one edge of the stone, and a channel on another, to receive it, as represented in the following Figure.

Figure 2.



[*To preserve milk*: add 5 grs. of magnesia to a quart. To ascertain the quantity of cream which will be afforded by various specimens of milk, procure half a dozen glass tubes closed at one end, 9 inches long, and half an inch in diameter: fix them in a wooden frame: mark on each 4 several inches from the top, as a scale. The cream settling at the top after they have been filled with milk, will shew the quantity.—T C.]

MILK-THISTLE, or Ladies' Thistle, *Carduus marianus*, L. an indigenous plant, growing on ditch-banks, road-sides, the borders of cornfields, and on rubbish: it flowers in the month of August. Though often a very troublesome weed in pasture and other lands, the milk-thistle may be eaten in the spring as a salad: and the tender stalks, if peeled and soaked in water to extract their bitterness, afford a delicious dish: the scales of the flower-cup may be used as a substitute for artichokes; and the roots, as well as the leaves, while young, are wholesome food. Rabbits, likewise, are exceedingly fond of the leaves and stalks of the milk-thistle, which tend to preserve their health, when kept in a domestic state.

MILK-VETCH, or *Astragalus*, L. a genus of indigenous, perennial plants, consisting of 80 species; the principal of which, is the *glycyphyllos*, Common or Sweet Milk-vetch, Liquorice-vetch, Wild-liquorice or Liquorice, Cock's-head: it grows in meadows, pastures, and on ditch-banks, where it flowers in the months of June and July. This plant will thrive with uncommon luxuriance in poor barren soils; and yield an abundance of tender and succulent herbage. Its cultivation has therefore, been strongly recommended by Dr. Anderson, who observes, that it would be an excellent winter fodder for cattle, which devour it with avidity. Cows depastured on this plant, are said to yield an abundance of rich milk; from which circumstance it has received its most proper English name.

MILK-WEED, the Marsh, Wild Parsley, or Wild Milky Parsley, *Selinum palustre*, L. an indigenous perennial plant, growing in damp and marshy situations, where its stalk attains the height of three or four feet; and flowering in the month of June or July. Every part of this vegetable, on cutting it, exudes a milky juice: its aromatic root may serve as a substitute for exotic spices in medicine, and for culinary purposes: the Russians use it instead of ginger, and the Laplanders chew it in the same manner as tobacco.

MILK-WORT, the Common, or *Polygrala vulgaris*, L. an indigenous perennial plant, thriving on heaths and dry pastures; flowering in the months of June and July. This herb is eaten by cows, the milk of which it remarkably increases; also by goats and sheep, but is refused by hogs. Its roots possess an extremely bitter taste, together with all the virtues of the American rattle-snake-root. According to Duhamel, it is given with success in pleuretic cases, operating as a purgative, emetic, and diuretic. A spoonful of the decoction, made by boiling an ounce of the herb in a pint of water, till one half be evaporated, sensibly promotes perspiration, as well as expectoration, and has therefore been used with advantage in catarrhal fevers and defluxions on the lungs: three spoonfuls of this medicine, taken every hour, have sometimes afforded considerable relief in dropsical cases.

MILL, a machine for grinding corn, &c. of which there are various kinds, according to the different methods of applying the moving power: such as water-mills, those worked by horses, wind-mills, &c.

In September, 1801, a patent was granted to Mr. Zachariah Barratt, for a portable mill, designed to grind corn; and which may be worked either by wind, water, or horses. This contrivance differs from the common mills, chiefly in the following particulars: 1. That its size may be enlarged, or reduced according to circumstances; the whole running on castors; 2. The mill-shaft is moved by a crown wheel, containing 3 notched orbits, each being at some distance within the other; and which wheel may, by a slight alteration, be constructed so as to be set in motion, either by sails, by horses, or by water; and lastly, the machine may, if required, be conveniently erected at the gable end of a barn. A more particular account of this mechanical invention is given in the 16th volume of the "*Repertory of Arts*," &c. where the apparatus is illustrated with an engraving.

Another patent has lately been granted to Mr. Thomas Wright, for a *Hand Stone Corn Mill*. The frame of the machine is three feet square, and three and a half feet in height: the stones are 18 inches in diameter, and are inclosed in a tub, supported by two cross-bearers. Beneath these stones, there is a lever, in which is inserted an iron pin; that passes through the centre of the bed-stones, and communicates with various machinery, that sets the whole in motion. Our limits not permitting us to detail its constituent parts, we can only add, that a drawer containing three sieves is placed under the stones, for the reception and sifting of the meal. The price of this mill, is 16, or, with the drawers and sieves, 17 guineas: and the machine is asserted to grind six bushels of grain in one day, with perfect ease. A farther account of Mr W.'s ingenious contrivance may be found in the 38th vol. of "*Annals of Agriculture*," where his description is illustrated with an appropriate plate. See also Water-Mills.

Mills for grinding grain, and for sawing timber, have been much improved within a few years past in the United States. The principal improver of grain mills, was the late Mr Oliver Evans, of Philadelphia. It would be impossible by any description, or even by engravings, to convey an accurate idea of these improvements; we must therefore refer those who may be anxious to inform themselves respecting them, to a mill in which they are constructed; or to Mr. E.'s "*Miller's and Mill-wright's Guide.*" Philadelphia, new Ed. in which they are amply detailed, together with a variety of other useful matter respecting the erection of mills. It may be sufficient for the present, to state, that his improvements consist of the invention and various applications of the following machines, viz.

1. The elevator,[*]
2. Conveyer,
3. Hopper boy,
4. Drill,
5. Descender;

Which five machines are variously applied in different mills, so as to perform every necessary movement of the grain and meal, from one part of the mill to the other, or from one machine to another, through all the various operations, from the time the grain is emptied from the wagoner's bag, or from the measures on board the ship, until it is completely manufactured into superfine flour, and other qualities, and completely separated, ready for packing into barrels. All which is performed by the force of the water, without manual aid, except to set the different machines in motion; and serve to lessen the labour one half.

Many mills in the state of Pennsylvania, and Delaware, have been constructed upon the plan of Mr. Evans; but they are in the fullest operation at the extensive mills of Messrs. Ellicot's, near Baltimore, who have added other improvements tending to perfect the grinding, and to the diminution of manual labour. Indeed, Dr. Mease was assured by an observing gentleman, who has travelled much *in* the old world, that more complete mills than Mr. Evans's are not to be seen in Europe.

In the 19th vol. of the *Transactions of the London Society of Arts*, (1801) Mr. Garnet Terry, of London, describes a hand-mill for grinding hard substances, which is simple in its construction, and may be applied to a variety of useful purposes, especially in the country; the editor has therefore given a plate of it. See plate XIV of this volume. The front of the mill is taken off, in order to shew its interior construction.

DESCRIPTION.

A, the hopper, the receptacle of the articles which are intended to be ground.

B, a spiral wire, in the form of a reversed cone, to regulate the delivery of them.

C, an inclined iron plate, hung upon a pin on its higher end: the lower end rests on the grooved axis D, and agitates the wire B.

D, the grooved axis, or grinding cylinder, which acts against the channelled iron plate E.

F, a screw on the side of the mill, by means of which, the iron-plate E. is brought nearer to, or removed further from the axis D, according as the article is wanted finer or coarser.

G, the handle by which motion is given to the axis.

H, the tube, whence the articles, when ground, are received.

Mr. Terry says, he has made one on a large scale, and finds it answers the purpose of reducing to powder, coffee, bones, beans, peas, malt, barley, &c.

Family mills for reducing wheat to flour, have lately been introduced into England; and Dr. Willich describes that invented by T. Rustall, mill-wright of Purbroothheath, near Portsmouth: but the description has been omitted, because such mills are useless in this

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[* There is no sufficient evidence that Mr. Evans was the inventor of the elevator and conveyer. The elevator is the common *noria*, described in books of mechanics in France and England long before Mr. Evans's patent: the conveyer is Archimedes' screw. For a description of the noria, see the Rev. Mr. Townsend's travels in Spain.—T. C.]

country, where water-mills are within an hour's ride of almost every farmer. A plate and description of the machine may be seen in the 18th vol. of the transactions of the above society.

Mr. John Jackson, in the entertaining *Journal of his route from India to Hamburgh by land*, 1799, says, "On the river Danube, below Pest, are many floating corn-mills, which are admirably adapted for the purpose. The vessels on which the mills are built, are always kept afloat, and at anchor, in the middle of the stream; the wheel is turned by the current.." Such mills might be advantageously used on the rivers of the United States.

MILL REEK, a dreadful disease, caused by the poisonous fumes of melted lead, which affect not only those who are employed in the smelting or preparing of that metal, but likewise all who reside near the mines whence it is dug, or contiguously to the furnaces, &c. where it is worked.

On the first attack of this disease, the patient feels a weight and uneasiness in the region of the stomach, and a slight degree of colic in the bowels: the pulse is low; the appetite impaired; the legs become feeble, and the whole body is debilitated. Sometimes these symptoms abate in consequence of a slight diarrhœa; though, if the latter continue for some time, it is always attended with danger.

At first, however, the patient is not prevented from following his usual occupations; but, if the disorder progressively increase, and he neglect to apply for relief, the next symptoms will be, obstinate costiveness, violent pain in the intestines, a troublesome giddiness, insensibility and delirium. The extremities become convulsed; the pulse intermits; and, at length, the highest degree of palsy, or apoplexy, closes the distressing scene.

The *mill-reek* is of a similar nature and origin with the *Devonshire-colic*, of which we have already treated under the article Lead, where the reader will find a short account of its most successful treatment. We cannot, however, conclude this article without recommending the following precautions (from the first vol. of the Edinburgh *Essays and Observations, physical and literary*, &c. 1754) to the attentive consideration of the humane. It is a duty incumbent on all those persons who are in any manner connected with the manufacture of lead, or who reside in the vicinity of lead-mines, to spread and inculcate the means of rescuing many industrious members of society from a most painful death; or, if a person be attacked by this terrible disease, to contribute their share towards preserving them from feeling its extensive horrors.

1. No labourer should be suffered to repair to his work, *fasting;* his food ought to be fat and oily, and it would be very beneficial, if he were to drink a glass of sweet oil, either pure, or mixed with a little brandy, every morning.

2. It will be advisable to take some aperient physic, not only in the spring and in autumn, but likewise, as often as any symptoms of the mill-reek, however slight, are perceived.

3. No spirituous liquors should be allowed, or at least, be very sparingly used, especially while the labourer is at work, or immediately after it.

4. No workman in a state of perspiration must expose himself to the cold air; but he should retire to his home, as speedily as possible; and, after having changed his clothes, cool himself gradually.

5. Immediately after the labourer returns from his work, he ought to take some nourishing aliment, which should principally consist of fat broths, or similar liquids.

6. The diet should be wholesome and nourishing; because scanty or poor food disposes such persons to be more frequently affected, and renders them too feeble to undergo a complete cure.

Lastly, as often as their employment will permit, they ought to visit an open country, where they may breathe an untainted air, and find provisions free from the noxious fumes of lead. Particular care must, however, be taken not to venture upon long journies; because such persons will be more fatigued, and reduced, by travelling one day, than by labouring two days in the lead-mines.

MILL-STONE, signifies the large circular stone, by means of which, when put in motion by machinery, corn is ground into flour.

The diameter of the common millstones is, in general, from five to seven feet, and their thickness varies from 12 to 15 or 18 inches. They usually endure 35 or 40 years; and, when they have been employed for a long time, so as to be considerably diminished, they are *edged*, or cut anew, in order to communicate to their surface a figure contrary to that which they originally bore; afterwards the upper mill-stone is made the lower, or bed-stone.

These stones are an article of extensive utility, and were formerly imported in great numbers from France: the *burr-stones* of that country having been found harder and more durable than any that were dug out of British quarries. [In America, the true burr stone (buhr) is found near the dividing line of South Carolina and Georgia. Inferior burr-stones, cellular quartz, are found near Allentown, Northampton county, Pennsylvania. The true buhr stone is found in alluvial soil, full of marine shells, which being decomposed by the air, their place is occupied by an infiltration of chalcedony, or of chut.—T. C.]

MILLET, or *Milium*, L. a genus of plants, consisting of five species; of which the following are the principal; namely:

1. The *panicum*, or common Millet; which is a native of India, and seldom cultivated in Britain, except in gardens, for the sake of its small round seed, that affords grateful food to poultry. It may, however, be easily propagated, by sowing it in the beginning of April, upon a warm dry soil, but not too thick; because the plants, when growing, expand, and require much room. Hence they should be kept clean from weeds, at their first shooting up. In August, the seed attains to maturity; but, if exposed to the depredations of birds, they will devour it as soon as it begins to ripen. There is a variety of this species, called the *African Millet*, the culture of which has been recommended by M. Tschiffeli, of Switzerland. It flourishes in every soil, requires neither rich manures, nor laborious tillage; and it is not devoured by birds, nor does it exhaust the soil, though affording very abundant crops. Another variety of this species is the *panicum germanicum*, cultivated in Germany and the south of Europe; and which, according to M. Buse, of Erfurt, thrives in a good clayey soil, where it sometimes produces more than a thousand-fold returns.

2. The *effusum*, Millet-grass, or Soft Millet; which is a native of Britain, grows from five to six feet in height, in moist shady woods; and flowers in the months of May and June. This plant is very beautiful; and though it has no useful property to recommend it to the industrious farmer, yet it deserves to be cultivated in shady gardens, on account of its fragrant odour. Its seeds are eaten with great avidity by linnets.

Besides its utility for feeding poultry, millet is highly esteemed for making puddings, and by many preferred to rice. As an article of food, however, it is by no means equal either to blanched oats, or barley, and ought not to be eaten by persons whose organs of digestion are weak, or impaired.

MIMOSA, a genus of plants of the polygamia monoecia class and order, of which there are eighty-five species known. The Mimosa sensitiva, sensitive plant, rises with a slender woody stalk seven or eight feet in height, armed with thorns: the principal stalk has many heads of flowers on the upper part, for more than a foot in length: this as well as the branches is terminated by heads of flowers, the leaves move but slowly when touched, but the foot-stalks fall when they are pressed hard. "Naturalists," says Dr. Darwin, "have not explained the immediate cause of the collapsing of the sensitive plant; the leaves meet and close in the night, during the sleep of the plant, or when exposed to much cold in the day time, in the same manner as when they are affected by external violence, folding their upper surfaces together, and in part over each other like scales or tiles, so as to expose as little of the upper surface as may be to the air; but do not, indeed, collapse quite so far; for when touched in the night during their sleep, they fall still further; especially when touched on the foot-stalks, between the stems and the leaflets, which seems to be their most sensitive or irritable part. Now as their situation after being exposed to external violence resembles their sleep, but with a greater degree of collapse, may it not be owing to a numbness or paralysis consequent to too violent irritation, like the fainting of animals from pain or fatigue? A sensitive plant being kept in a dark room till some hours after day break, its leaves and leaf-stalks were collapsed as in its most profound sleep, and on exposing it to the light, above twenty minutes passed before the plant was thoroughly awake, and had quite expanded itself. During the night the upper surfaces of the leaves are oppressed; this would seem to shew that the office of this surface of the leaf, was to expose the fluids of the plant to the light as well as to the air."

MINERAL KINGDOM, an expression comprising all bodies that are dug out of subterraneous places, or *mines*, being totally inanimate, and devoid of the power of life, motion, nutrition or sensation.

Minerals are natural bodies destitute of organisation and life; and **Mineralogy** is defined to be that branch of natural science which treats of the properties and relations of such bodies.

If we penetrate beneath the surface of the earth we observe a very remarkable arrangement. Instead of a generally uniform appearance, as we see on the surface, we pass through divers substances, as clay, gravel, sand, and numerous others, deposited in *beds* or *strata* of various thickness, from a few inches to a great many feet, (Pl. VII. Vol. II. Fig. 1). These lie, for the most part, nearly horizontal; but in some instances, particularly in mountainous countries, they take different degrees of elevation; and, in places where the country consists of gently sloping hills and vales, the beds have a waving or bending form (Fig. 2.) It has been justly remarked, that the strata of which the earth is composed, as deep as the curiosity or the necessities of mankind have induced them to explore, very satisfactorily manifest the wisdom which has been displayed in the arrangement of materials requisite for the use of men and animals.

The first layer is frequently a rich, black mould, formed almost wholly of the remains of animals and vegetables which have lived through their destined periods. This yields sustenance to the vegetable productions; and thereby becomes the actual, though not the immediate, support of the whole animal creation.

Beneath this is often found a thick bed of clay, that furnishes to man a substance of which to make bricks, tiles, together with various kinds of pottery, and innumerable other articles for the comfort of social life.

Next to this, vast beds of gravel are in general found, which are of use in numerous points of view.

Underneath this are the infinitely varying strata, of sandstone, limestone, &c. These not only serve for the construction of buildings, and for other important purposes, but also frequently surround parts of those mines which contain the valuable metals.

Beneath a slaty strata are usually discovered those immense beds of coal so requisite for the comfort, and, in some situations, even for the existence of man.

The above strata, it is true, are not always found together, nor are they always discovered in the same order; but the statement will suffice to show the general nature of their arrangement.

Minerals are sometimes observed in detached *masses* of various size, and situated at various depths in the earth (Fig 3.)

They are also found in a kind of natural clefts which cross the regular mineral beds or strata in different directions (Fig. 1, *a*, Fig. 4, *b*.) When these contain metallic ores, they are styled *veins*; but when they contain only stony or earthy matters, the miners call them *dykes* They vary much both in magnitude and length. Six thousand feet are considered an unusual length for veins, though in some instances they have been traced upwards of four miles. Few veins extend more than 200 fathoms below the surface of the mountains in which they are situated. They are usually much inclined; but they sometimes descend in a direction parallel with the beds of the rock in which they occur.

At the places where dykes or veins pass through the earth, they occasionally disjoint the strata in a very singular manner, (Fig. 4.) Some of the coal strata, for instance, are thrown down or raised on one side of a dyke upwards of a hundred yards; and the miner, after penetrating through it, instead of finding the same coal again, meets on the opposite side with beds of stone or clay. Hence he is frequently at a loss how to proceed in searching for the coal of which he is in pursuit: and hence it is that to such dykes the peculiar name of *faults* has sometimes been given.

In England the *metallic ores* are generally found in veins, which form a considerable angle with the regular strata. This in Cornwall is uniformly the case. And it is remarkable, concerning the veins of tin and copper of that county, that they run in a direction nearly east and west; whilst the dykes, or veins of other substances, run for the most part north and south.

The thickness of veins, and the quantity and quality of the ore they contain, differ in every mine. Some are only a few inches wide, whilst others extend to the width of several feet. The vein of Dolcoath mine, in Cornwall, varies from two or three to forty feet and upwards; and in some parts it even contracts so as to be little more than six inches across.

In Cornwall the first traces of tin and copper are stated to be usually found at the depth of 80 or 100 feet under the surface, and to be rarely nearer than 80 feet. Some of these metals have been worked to the length of three and even four miles; and with respect to their depth, it is said that no miner has ever yet seen the bottom of a vein; although several have been wrought to the depth of more than 1000 feet from the surface, and two or three to nearly, if not quite, 1300 feet. The deepest mine in England is said to be the copper mine at Ecton, in Staffordshire, which is worked at the depth of more than 1410 feet.

It is frequently observed that metallic veins are separated from the substances they intersect by a thin wall or lining of mineral different from these substances, and also by a layer of clay on each side of the vein. It is also remarked that the same substance which forms the outer coat of the vein is often intermixed with the ore, or forms layers alternately with it. This has usually the denomination of *matrix*, or *gangue*.

There are few mines of any considerable depth that would not be flooded with *water* from internal springs, were not means adopted for drawing off this fluid. The steam engines which are employed for this purpose in some of the Cornish mines are so powerful that they are said to discharge incessantly, throughout both night and day, a quantity of water equal to at least 1000 gallons, or near 20 hogsheads, every minute.

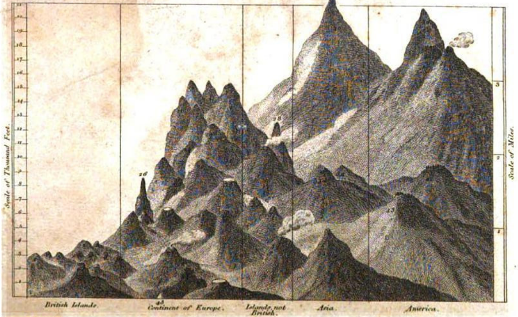
To a superficial observer, perhaps nothing would appear more easy than to describe a mineral. This, however, is by no means the case. The same general appearance sometimes prevails in substances that are very different from each other; and the same stone, in its different states, is oftentimes extremely varied in its appearance. To these difficulties, it must be added, that the combinations of mineral substances are multiplied to a great extent. A little application, however, particularly if the student be possessed of a collection of arranged and named specimens, which he will have no difficulty in procuring at a very reasonable price, will enable him to overcome all the obstacles that otherwise might impede his progress in beginning to acquire a knowledge of this interesting science.

The most simple and natural division of minerals is into four classes, of 1. Stones; 2. Salts; 3. Combustibles; and, 4. Metals; which are treated of in their alphabetical order.

It will somewhat tend to illustrate the history of the mineral kingdom, to state, under a tabular form, the relative heights of the principal mountains or masses of rocks, which occur in the different countries of the world; previously remarking that, by far the most lofty and magnificent of these, respecting which any account sufficiently authentic has hitherto been obtained, are the Andes on the continent of South America, one of which, Chimborazo, is 20,900 feet, or nearly four miles in perpendicular height above the sea; that of the European mountains, the highest is Mont Blanc, in Switzerland, which measures 15,680 feet, or about two miles and three-quarters; that the loftiest summit within the British island is Ben Nevis, in Inverness-shire, Scotland, which does not exceed 4380 feet, or somewhat more than three-quarters of a mile; and that the great pyramid of Egypt, the loftiest work of human art and industry, with which we are acquainted, and which will serve as a point in the scale, measures only 315 feet.

Page 371 Vol. 2.

COMPARATIVE HEIGHT OF MOUNTAINS, CITIES AND LAKES.



HEIGHT OF THE PRINCIPAL MOUNTAINS.

			Plate XVI. Fig.	Ft. above the Sea.
British Islands.	Scotland	Ben Nevis, Inverness-shire,	1	4350
		Ben Lawers, Perthshire,	2	4051
	England	Skiddaw, Cumberland,	3	3530
		Cross Fell, Cumberland,	4	3390
		Helvellyn, Cumberland,	5	3324
		Wharnside, Yorkshire,	6	2480
		Ingleborough, Yorkshire,	7	2380
	Wales	Snowdon, Caernarvonshire,	8	3568
		Cader Idris, Merionethshire,	9	3550
	Ireland	Macgillicuddy's Reeks, Kerry	10	3404
		Sleibh-Dorin, Londonderry,	11	3150
Continent of Europe.	France	Mont d'Or, Auvergne,	12	6707
		Puy de Sansi, Auvergne,	13	6700
	Pyrenees	Mont Perdu, the highest of the Pyrenees,	14	11,283
		Le Pic Blanc, Spain,	15	10,205
	Alps	Loucira,	16	14,451
		Loupilon,	17	14,144
	Switzerland	Mont Blanc, highest mountain in Europe,	18	15,680
		Mont Rosa,	19	15,555
		Mont St. Gothard,	20	10,014
	Italy	Mont Cimone,	21	6401
		Vesuvius,	22	3900
	Germany	Ortler-Spitze, Tyrol,	23	15,430
		Ostelle, Saltzburg,	24	12,800
		Carpathian mountains, highest summit,	25	8640
		Lomnitz Peak,	26	8640
	Sweden	Areskutan, Jemptland,	27	6180
Islands.	Teneriffe	Peak of Teneriffe,	28	12,236
	Sicily	Ætna,	29	10,963
	Jamaica	Blue Mountains,	30	7431
	Iceland	Snæfial,	31	6860
		Hecla,	32	4900
Asia.	Turkey in Asia	Mount Lebanon, estimated at,	33	9520
		Mount Ararat, estimated at,	34	9500
		Mount Ida,	35	4960
		Mountains of Thibet,	46	26,862
America.	Andes, South America.*	Chimborazo, Quito,	36	20,900
		Cotopaxi, Quito,	37	18,880

HEIGHTS OF REMARKABLE LAKES, CITIES, &c.

Alps	Lake of Lausanne,	38	8640
	Lake of Lanzon, on the mountain of Olan,	39	6797
Switzerland	Lake of Lucerne,	40	1408
South America	City of Riobamba, Quito,	41	18.800
	City of Quito,	42	9556
North America	City of Mexico,	43	7424
Austria	Town of Eisenerz,	44	2056
Egypt	The great Pyramid,	45	315

* The mountains of Thibet, in Asia, have been lately ascertained to exceed considerably the height of those of South America.

MINERAL WATERS, include all such fluids as are naturally impregnated with heterogeneous matter, which they have dissolved within the bowels of the earth, whether sulphureous, metallic, or saline; and, as many of these are successfully employed in medicine, they have received the appellation of *medicinal waters*.

Mineral waters have been divided into *hot* and *cold*, from their being either sensibly hotter or colder than the atmosphere. They have also been classed, according to their predominant ingredients, into *acidulous*, *alkaline*, *martial*, *sulphureous*, &c. It is not, however, our design to enter upon a minute investigation of their constituent parts; but, as the analysis of mineral springs may, to many inquisitive persons, afford a pleasing recreation, independently of its real utility, we shall subjoin a few rules necessary to be observed in making such experiments.

I. All experiments ought to be conducted near the spring, if it be practicable, and its geological situation noted.

II. The situation of such spring, the nature of the soil, and the contiguous rising grounds (if any occur) should be carefully examined mineralogically.

III. With the view of analysing the water, it will first be necessary to observe the changes it may spontaneously undergo, as well as the various parts, or matters, into which it may separate. For this purpose, it will be advisable to fill several shallow but large cylindrical glasses at the well, or spring, which should be immediately examined by the taste, eye, and smell: after which they ought to stand at rest for two, three, or more hours, or even as many days. At the end of this period, the investigation must be repeated: the fluid compared with water newly drawn from the spring, and if any separation of parts take place, any scum arise, or sediment be formed at the bottom of the glass, they ought to be carefully collected for future examination.

IV. The water in given quantity should then be gently evaporated in a China basin, by the heat of a spirit lamp, or in a sand bath moderately heated.

V. It will next be requisite to analyse the water *chemically*: for this purpose, a certain portion of it ought to be taken from the spring, and boiled in a retort with a pneumatic apparatus to collect the gas contained in the water.

VI The distilled water must next be examined by various tests—thus:

[Oxalic acid and its combinations with alkali, will detect LIME and the salts of lime by a white precipitate.

Yellow turmeric paper, will detect uncombined ALKALIS, by turning brown.

Infusion of litmus, of red cabbage, or brown turmeric paper, will detect uncombined ACIDS, which redden litmus and cabbage liquor, and turn brown turmeric paper yellow.

Muriate of platina, detects potash and the salts of POTASH, which precipitate the platina, while the alkali of soda does not produce that effect.

Acidulous nitrate of silver, detects MURIATIC acid and the muriates.

Lime water forms an insoluble precipitate with CARBONIC acid.

Sulphuretted hydrogen throws down LEAD from its combinations, in a black-brown precipitate. Sulphuric acid and its combinations also throw down lead in form of a white precipitate.

Polished iron or steel detects COPPER, by a coppery metallic crust on immersion.

Phosphate of soda, combined with a little volatile alkali, detects MAGNESIA.

MAGNESIA can also be thrown down by a hot solution of carbonate of potash, after you have gotten rid of the lime by the oxalats.

IRON is detected by infusion of galls, and by tincture of galls, which produce an inky tinge: and by common prussiate of potash, which produces a fine blue.

LEAD also is precipitated yellow by chromate of potash.

Thermal waters, or warm springs and carbonic acid waters, are indubitably owing to subterranean fires; in the latter case, acting on lime-stone. Sulphuretted hydrogen waters, are probably owing to the decomposition of iron pyrites in the immediate vicinity of coal strata.—T. C.]

MINT, or *Mentha*, L. a genus of plants comprising 24 species. 12 being natives of Britain; of which the following are the principal:

1. The *Pulegium*; See PENNYROYAL.

2. The *Arvensis*, or CORN-MINT; growing on moist heaths, pastures, and in sandy inundated fields; flowering from June to September.—It is eaten by horses, and goats, but disliked by sheep, and refused by hogs and cows; though the animals last mentioned devour it eagerly towards the end of the summer, when pressed by hunger, and the pastures are bare; in which case it prevents the coagulation of their milk, so that it is with the greatest difficulty converted into cheese.

3. The *viridis*, or SPEAR-MINT, which grows on the banks of rivers, and in watery situations; flowers in the months of July and August. It is propagated by parting the roots; and, as its flavour is more agreeable than that of most other species of this plant, it is generally prefered for culinary purposes. The leaves of the Spear-mint, when prepared with sugar, form a delicious conserve; and the distilled waters, both spiritous and simple, are highly esteemed for their mildness and pleasant taste. The leaves are eaten in the spring as a salad; and their juice, when boiled with sugar, is formed into lozenges.

4. The *Piperita*, or PEPPER-MINT, growing in watery places, and on the banks of rivulets; flowering in the months of August and September. Its stem and leaves abound with minute vesicles containing a very pungent essential oil, that rises in distillation.—This species is the strongest and most aromatic of the mints, on which account it is alone used in medicine, and the liquor prepared from it, is known under the name of *Peppermint-water*. Being an excellent stomachic, it is but too often used in cases of impaired appetite, flatulence, colics, nausea, and inclination to vomit. It has also occasionally been found of service in hysteric affections; and, however harmless in itself, when considered as a *simple* water, this *exhilarating carminative* is so far a dangerous domestic medicine, as with many nervous and irritable persons, it is apt to introduce a habit of *tasting* the stronger spiritous liquors.

MISSELTOE, the COMMON, White Misseltoe, or Missel; *Viscum album*. L. a parasitical plant growing on Apple and Pear-trees, the Hawthorn, Service, Oak, Maple, &c.; flowering in the month of May.

From the berries, as well as the bark of this plant, good bird-lime may be prepared; and, if the former be rubbed, when fully ripe, on the bark of almost any tree, they will adhere closely, and produce plants in the succeeding winter.

MITE, or *Acarus*, L. a genus of insects, consisting of 35 species, the principal of which is the *Airo*, COMMON, or CHEESE-MITE. It is very small, and when first hatched, is so extremely minute as to be scarcely perceptible by the naked eye. Though principally infesting cheese, there are several varieties of this species, breeding in flour, meal, &c. and occasioning considerable injury. The most effectual method of expelling these noxious vermin is, according to LEEUWENHOEK (who was indefatigably attentive to their generation and growth), to place a few nutmegs in the sack, or bin containing the flour, as the odour of that spice is insupportable to mites: which will thus be removed, without the meal acquiring any unpleasant flavour. FUNKE advises a cheaper remedy, consisting in the decorticated thick branches of the lilac or elder-trees, which are to be put in the flour, and will answer both as a preventive; and for their expulsion.

There are other species of mites, that breed in animals when unclean or filthy, especially in dogs, cows, &c. nay, even on insects. Nor is the human body exempt from their invasion, particularly when infected with the itch (or other eruptive disease), of which they are by many considered as the cause; mites have been frequently found in the watery pustules which occasion that peculiar itching sensation. In dysentery, also, these vermin have been ejected with the fœces; whence it is evident that they live and prey on the interior parts of the system. [Indeed all animals afford nutriment to parasite animals, and perhaps all plants either to parasite animals, as insects, or to parasite plants, as the misseltoe, the mosses, &c. &c.—T. C.]

MOHAIR, in commerce, the hair of a kind of goat, frequent about Angora, in Turkey; the inhabitants of which city are all employed in the manufacture of camblets made of this hair.

MOLASSES, or MELASSES, the gross fluid matter, which remains after refining sugar; and which cannot by simple boiling be reduced to a more solid consistence than that of common syrup, vulgarly called *treacle*.

In Holland, this article is chiefly used in the manufacture of tobacco, and by the poor people as a substitute for sugar. A kind of brandy is prepared from it in this country, in considerable quantities, by dissolving a certain portion of molasses in water; fermenting it with wine-lees; and distilling the whole over a moderate fire. This spirit is, however, generally adulterated in such a manner as to render it extremely pernicious to the consumer; but as it tinges the hands, or any substance immersed in it, of a fine yellow colour, it may, we conceive, be more advantageously converted to the purposes of dyeing.

Molasses likewise form a wholesome and agreeable beverage, when prepared as a kind of **Beer**, of which we have already given an account, in our first volume.—Farther, this thick fluid may be divested of its mawkish taste, and thus rendered fit to be used as a substitute for sugar. We select the following process from **Crell's** *Chemical Annals*, published from the experiments originally made by M. **Lowitz**: Let 24lbs. of molasses, a similar quantity of water, and six pounds of charcoal coarsely pulverised, be mixed in a kettle, and the whole boiled over a slow fire. When the mixture has simmered for the space of half an hour, it must be decanted into a deep vessel, that the charcoal may subside; after which the liquid should be poured off, and again placed over the fire, that the superfluous water may evaporate, and restore the syrup to its former consistence. Twenty-four pounds of molasses thus refined, will produce an equal quantity of syrup.

This method has been successfully practised, on a large scale, in Germany; and, we conceive it might be advantageously imitated; for the molasses thus become sensibly milder, and may consequently be employed in various articles of food. For dishes, however, in which milk is an ingredient, or for cordials which are to be mixed with spices, it will be preferable to make use of sugar.

MOLE, or *Talpa*, L. a genus of quadrupeds, consisting of seven species, of which the *Europæus*, or European Mole, only is found in Britain. It abounds in all parts of Europe, excepting Ireland.

This animal is from five to six inches in length: its head is large, without any external ears, and its eyes are so very minute, and concealed in the fur, that it is vulgarly believed to be blind.

The mole chiefly frequents meadows, gardens, and moist fields that are exposed to the sun, especially on the approach of rain; when it does considerable damage, by loosening the fibres and roots of vegetables, while constructing its subterraneous abode. The female produces from four to six young at a time, which are deposited in nests, artfully made with moss, leaves and dried grass, beneath the largest hillocks of the field. These dwellings are formed with admirable ingenuity, consisting of an interior hillock, surrounding with a ditch, that communicates with several streets, bye-ways, and galleries.

Various means have been contrived for extirpating *moles*, such as irrigating the fields infested with them, &c. but the most effectual is that described by Dr. **Darwin**, in his *Phytologia*, and derived from the experience of a successful mole catcher. This man commenced his operations before the rising of the sun, when he carefully watched their situation; and, frequently observing the motion of the earth above their walks, he struck a spade into the ground behind them, cut off their retreat, and dug them up.

As moles usually place their nests much deeper in the ground than their common habitations are situated, and thus produce an elevation, or a *mole-hill*, the next step is to demolish such nests by the spade; after which the frequented paths must be distinguished from the bye-roads, for the purpose of setting subterraneous traps. This will be effected by marking every *new* mole-hill with a slight pressure of the foot, and observing the next day, whether a mole has passed over it, and effaced such mark; which operation must be repeated two or three mornings in succession, but without making an impression so deep as to alarm and induce the animal to open another passage.

The traps must now be set in the frequented paths, and ought to consist of a hollow wooden semi-cylinder, each end of which should be furnished with grooved rings, containing two nooses of horse-hair, that are fastened loosely in the centre, by means of a peg, and are stretched above the surface of the ground, by a bent stick or strong hoop. As soon as the mole passes half way through one of these nooses, and removes the central peg in his course, the curved stick rises in consequence of its elasticity, and thus strangles the animal.

The method above detailed being ingenious, it deserves to be generally adopted; as those, whose grounds are infested with moles, may easily extirpate them, to teach the art to their labourers. It is, however, in our opinion, an undecided point, whether these little quadrupeds, that live entirely on worms and insects, of which they consume incalculable numbers, are not to be considered as harmless, nay useful rather than noxious; especially as they have their formidable *natural* enemies in foxes, martins, weasels, hedge-hogs, serpents, and cats. Farther, it has been observed, that fields and gardens, where all the moles had been caught, abounded with vermin and insects. But, if these burrowing creatures become too numerous and hurtful to the vegetation of plants, or dangerous to dykes and banks, the most easy method of destroying them is, to expose a few living lobsters in a deep glazed earthen vessel, the top of which is somewhat narrower than its basis, so that they cannot escape: such a pot must be buried several inches deep in the ground, and covered with green sods, so as to be accessible to the mole, which is remarkably partial to that shell-fish. No sooner has one of the former entered the pot, than others from the vicinity will hasten to the fatal recepticle, in consequence of the noise made by the captive; and thus meet with inevitable destruction.

MOLE-CRICKET, or *Gryllus gryllotalpa*, L. a destructive insect, in the vicinity of rivers, infesting moist meadows, and gardens, in which it does great injury to the plants and roots; destroying whole beds of cabbages, flowers, &c. It is produced from an egg, and furnished with wings similar to those of the common cricket, together with a pair of fore-feet resembling those of a mole, and with which it works its way beneath the soil, raising up ridges in its subterraneous progress, and defacing the beauty of garden-walks. No method has hitherto been discovered of preventing the depredations of these pernicious vermin. But, as the generality of crickets are particularly averse to the fetid exhalations of hog's-dung, it is highly probable that the *mole-cricket* may be expelled, though not extirpated, by spreading this kind of manure upon infested lands.

MOLE-PLOUGH. See **DRAINING**, and **PLOUGH.**

MOLLUSCA, in natural history, the name of the second order of the Linnean class Vermes. They are naked, furnished with tentacula, or arms, for the most part inhabitants of the sea, and by their phosphorescent quality illuminate the dark abyss of the waters.

MOLTEN-GREASE, a disorder in horses, consisting of a fat or oily discharge with the fœces; it arises from a colliquation, or melting down of the animal's fat, in consequence of violent exercise in hot weather.

This disease is always attended with fever, heat, restlessness, starting, and tremblings, great sickness, shortness of breath, and sometimes with inflammatory symptoms. The horse rapidly becomes lean, and, if it survive this attack, commonly grows hide-bound; his legs swell, and continue in that state, till the humours are in a more natural condition; but, if the disorder be neglected, the farcy, or an obstinate surfeit, generally succeeds, and which is with difficulty removed.

The first step towards effecting a cure of this malady, ought to be profuse blood-letting; an operation which should be repeated, though in smaller quantities, for two or three successive days. Immediately after these evacuations, two or three rowels should be introduced, with a view to promote a large drain; while cooling emollient clysters are administered, to abate the fever. The drink should consist of warm water or gruel, with cream of tartar, or nitre, in order to dilute or attenuate the blood; which, in this case, is greatly disposed to become clotted, and to engender a total stagnation of the fluids.

When the fever has abated, and the horse has recovered his appetite, the following mild purgative should be given once a week, for some time, till the disorder be entirely removed: Take of Socotrine aloes 6 drachms, of pulverised gum guaiacum ½ an ounce, of diaphoretic antimony and powder of myrrh, each 2 drachms; form the whole into a ball with syrup of buckthorn. While this medicine is operating, the horse's labour should be suspended for two or three days every week: thus, he will lose neither his flesh nor appetite, but improve in both; because this ball is, on the whole, preferable to any other preparation for that purpose.

MOLYBDENA, a mineral that is frequently confounded with *black-lead;* though possessing properties widely different from the latter. It is of a laminated texture, or formed of plates which slightly cohere; are somewhat greasy to the touch, and soil the fingers; leaving, on paper, marks or traces of a dark-grey colour.

[It can be distinguished from black-lead or plumbago, thus; on a china tea cup, black lead produced a black streak, molybdena an olive-coloured streak. It is found in granite very commonly, but in small quantities. It is very common in the granite and the quartz at Chester in Pennsylvania: also in Massachusetts and Maine.—T. C.] It is insoluble in the sulphuric and muriatic acids; though, in a boiling heat, it tinges them green; effervesces with warm nitric acid leaving a grey oxyd or powder undissolved: and also with soda, to which it imparts a reddish pearl-colour.

Molybdena is at present extremely ly scarce; but, should it ever be found in abundance, it will certainly be of great utility both for dyeing and painting. If one ounce of the perfect oxyd of molybdena, be boiled with sixteen ounces of water, till the liquor is reduced to one-third; then filtered, and half an ounce of it poured into a small glass vessel, containing ten grains of tin-filings; and next, if four drops of the muriatic acid be added to this mixture, and the whole be sufferred to stand at rest, a fine blue colour will be speedily produced, which rises from the bottom; gradually acquires a deeper shade; and is, at length, deposited in the form of a blue powder.

A beautiful *blue lake* may likewise be obtained, by precipitating the solution of muriat of tin, by means of dissolved molybdat of pot-ash, if both solutions be previously diluted with a considerable proportion of distilled water. This precipitate is called by Richter *blue carmine;* and, we conceive, might be of eminent service to portrait-painters.

MOMENTUM, in mechanics, signifies the same with impetus, or quantity of moving body, which is always equal to the quantity of matter, multiplied into the velocity.

MOMORDICA, a genus of plants, of which there are eight species, the most remarkable of which is the Momordica balsamina, common balsam apple. This is a native of India, and is famous for curing wounds: the inhabitants cut open the unripe fruit, and then infuse it in sweet oil, till the oil becomes red: in this state, when applied to wounds, they are readily healed. [Elaterium is used in dropsies.—T. C.]

MONEY, a piece of metal, which by public authority bears a certain weight and value, so that it may serve as a circulating medium in commerce.

Money is, in general, divided into two kinds, viz. *imaginary*, or money of account; and *real*, or effective. The former class includes such as never was coined in *specie;* and though a certain term for expressing it has been invented or retained in different countries, with a view to facilitate the stating of accounts, by keeping them on an uniform basis, yet this ideal money is not liable to be changed in the same manner as current coins, which are raised, or lowered, as the exigencies of the state may require. Of this nature, for instance, are the *Pound, Shilling*, and *Penny*, as well as the nominal monies of other countries.

Real money comprehends all coins or species of gold, silver, copper, &c. which do exist, and are commonly current. Such are eagles and half-eagles, in gold; dollars, half-hollars, and quarter-dollars, in silver; and cents, in copper. See Coins.

MOON, in astronomy, one of the heavenly bodies, usually, though erroneously, classed among the planets; for it is with more propriety considered as a satellite, or secondary planet.

The mean distance of the moon from the earth, is computed by astronomers, to be about 240,000 miles: her diameter is as 100 to 365, that is, about 2,180 miles.

The moon appears to us under various forms; being sometimes horned, at others semi-circular; then full and round. Sometimes this celestial body increases; at others, it is on the wane; illuminating the globe we inhabit, at certain periods throughout the whole night, at others only for a few hours. The cause of these appearances is believed to arise from the moon being an opaque dark body, which shines only with the light she receives from the sun; hence only the part turned towards that luminary can be illuminated, and consequently transmit light; as the other side is involved in its native darkness. These phenomena, however, it is not within our province to explain; and, as the inquisitive reader will doubtless consult the writings of Maskelyne, Herschel, and other astronomers, who have devoted their sleepness nights to the observation of this satellite, we shall not enter into any farther details. See also Astronomy.

Formerly, the moon was believed to possess considerable influence on the human body; but such opinion, though sanctioned by the name of Mead, and other eminent physicians, is now generally exploded. This luminary, however, greatly influences the vegetable creation, and likewise appears to affect quadrupeds, especially horses. It is well known, that these useful animals are subject to a weakness of the eyes (particularly when they are somewhat advanced in years); and that such debility increases, or decreases, according to the course of the moon; whence they are said to have *moon-eyes.* Thus, in the wane, they are dull and muddy, or troubled; but on the approach of the new moon, they re-assume their former lustre. No remedy has hitherto been discovered for this affection, which generally terminates in total blindness.

MOOR, or **Moor-land**, a black, light, soft soil, remarkably loose, without any admixture of stones, and containing a very small proportion of clay or sand.

This earth usually forms the uppermost stratum of fen lands, and consists almost wholly of pure vegetable matter, which renders it very fertile. Moors, however, are subject to inundations, and they retain moisture for a considerable time, so as to render it difficult for cattle to graze, without poaching the soil. To remedy this inconvenience, the tenants of such lands, pare and burn them at certain seasons of the year; by which process their nature is considerably improved, as the surface readily takes fire, and burns freely.

In other respects, the conversion of moors into arable or pasture land, varies little from the method already stated under the article Marsh; provided such tracts of ground be in a plain, or on a level. It will be advisable, however, to plant the black willow preferably to any other tree or shrub; as it flourishes well on moors, and affords an excellent shelter to cattle during stormy weather. The course of crops that has been found most profitable, is, for the first three years, grass; that is, hay-seeds, and the different kinds of clover, sown after the surface has been burnt and ploughed in: during the next three years, two crops of corn, with an intermediate fallow. By such rotation, lands that were naturally of little value, have been rendered fit to produce very beneficial crops.

But, where moors occur in mountainous situations, Mr. Young recommends them first to be drained and irrigated, as the water will work numerous passages round the heath, that is usually found in moorlands; but which will speedily perish when flooded, and will be succeeded by sweet grasses, and other useful plants.

The next step will be to inclose the land with a double, dry stone-wall, between which young oaks, alders, ash, holly, mountain-ash, &c. may be advantageously planted; for, independently of the immediate shelter thus afforded to cattle, they will, in the course of a few years, become very profitable woods. In some cases, a simple inclosure has, without farther cultivation, been found very beneficial for feeding the common Scotch wethers which are distinguished by black faces and legs, and long coarse wool. Mr. Young observes, that mountainous moors, if tolerably well covered with heath, intermixed with spots of sedge, rushes, and coarse grass, will support a sheep on an acre, throughout the year; and, as the rot seldom occurs on these lands, it has been found, that flocks pastured on them without the addition of hay, thrive well, and oftentimes better than those which are regularly foddered. If, however, the design be to establish a grass-farm, it will be advisable to pare, burn, and *lime* the lands, after which they must be once thinly ploughed, that the lime and ashes may not be too deeply buried.

As the cultivation of mountainous moors is either productive of great profit, or of total ruin, the greatest judgment is requisite in fixing the course of crops. The chief object being to convert these soils ultimately into good meadows, or sheep-walks, the tillage ought only to extend to the destruction of spontaneous growth; to the removal of the acidity peculiar to peat soils, and to support a flock during the winter: which purposes may be effected by paring and liming judiciously, and also by sowing hay. The first course which Mr. Young considers as deserving more particular attention, is:

1. Turnips, or cabbages.
2. Oats.
3. Grasses, *mown*.
4. &c. Grasses, *fed*.

This course is generally preferable to others; but, in case it should be found inadequate, he recommends the following variation to be adopted, viz.

1. Turnips or cabbages.
2. Cabbages or turnips.
3. Oats.
4. Grasses, mown.
5. Grasses, fed.

Such rotation is, in Mr. Young's opinion, far superior to that in which turnips, &c. and oats, are sown twice alternately, previously to laying down grass-seeds; because the grass is thus defended one year; whereas two alternate crops of oats too much exhausts the virtues of the manure, before the grass-seeds are sown; while the turnips, &c. being fed on the land, return to it, by the dung of the cattle, comparatively more than they derive or take from it.

As there are extensive wastes in various parts of England, which consist of moors, capable of being brought into a high degree of cultivation, the patriotic *Society for the Encouragement of Arts*, &c. has, from time to time, offered premiums for improving them. Large tracts of land have, in consequence, been rescued from a state of nature; but the most considerable improvement appears to be that effected by **John Mirehouse**, Esq. of Brownsdale, Pembrokeshire, on whom the Society, in 1800, conferred their gold medal; and whose merit we have incidentally mentioned, under the article **Draining**.

The quantity of land thus recovered, was 274 acres, situated between two hills, which extended nearly two miles in length: it was formerly a common, so completely inundated, as to be of little or no value. The lord of the manor having obtained an act of parliament for its inclosure, Mr. **Mirehouse** proposed to take a lease, on condition that the proprietors should cut a drain, and lay down a tunnel; which being accordingly executed, a lease was concluded, and Mr. **Mirehouse** proceeded to complete the drainage.

He formed a channel on the north side, and divided the land into 12 pieces by double ditches, of such a depth as the fall would allow, from a few inches to four feet: between the ditches, a space of about 30 or 40 feet was left for planting willows. The soil appeared a perfect sponge; and, as soon as the drains began to take effect, it sank so considerably that, after frequently lowering the ditches, the surface of the water remained nearly the same distance from that of the land. Having repeatedly sunk the principal drains and ditches, he at length obtained above three feet from the water to the surface of the land, *in the lowest parts*; and, in others, a level sufficient for his purpose.

The common being thus inclosed and divided, Mr. **Mirehouse** commenced the draining of each division, by small internal cuts, about twenty inches wide at the top, and of various depths, to three feet and a half, reducing them to six inches at the bottom; leaving those open which were in the direction of the plough, and filling up others with brush-wood. Both these drains answer to his entire satisfaction; and he observes that the whole common has been converted from a state of waste into excellent land, for the sum of 508*l.*

We regret that our limits do not allow us to detail the course of crops pursued by this truly "Practical Agriculturist;" let it therefore suffice to conclude, that barley and oats have seldom succeeded; but the wheat raised on this land, has been very abundant, and the grain weighty: cole-seed has also been cultivated with great advantage, as a winter food; the crops having in general been very fine, and enabled Mr. **Mirehouse** to feed great numbers of sheep during the space of four months, from January to April; and to fatten them much sooner than he had ever been able to effect on turnips of the best quality, produced on his *home-grounds*. In short, the land from being of no value, has already been very productive; and Mr. **Mirehouse** thinks it will, in a short time, become the most valuable meadow of the neighbourhood. The vegetable substance thus drained, has become a fine luxuriant black mould, to the very surface of the waters, and is daily losing its sponginess, and acquiring greater cohesion.

MORDANTS, in dyeing, signify those substances, which are employed for the purpose of macerating the stuffs, and rendering them capable of imbibing the tinging matter. Of this nature are, the sulphat of alumine: acidulous tartarite of potash; the solution of tin in nitro-muriatic, and oxygenated muriatic acids: the vegetable astringent principle, or gallic acid; acetite of alumine; sulphat of copper, or blue vitriol; arsenic; acetite of copper, or verdigris; and the sulphate of zinc, or white vitriol.

Mordants act on stuffs in two different ways: 1. By parting with a portion of their oxygen, in consequence of which the substance of such stuffs is changed, and their attraction for the pigment or colouring matter is increased; and, 2. By altering, in a similar manner, the nature of the pigment, and rendering it capable of coagulation. Thus the colouring matter undergoes several changes, and receives various degrees of a lighter or darker shade.

MOROCCO-LEATHER, the skins of goats tanned and dyed in a peculiar manner by the Turks; but which processes were originally invented in the kingdom of Morocco.

The skins (imported from Mogadore) are prepared in parcels, consisting of 36, divided into six bundles, which are folded in the middle, lengthwise, and thrown into a pit full of lime, whence they are taken out, rinsed in pure water, drained, and suspended in the shade to dry, till the hair becomes loose. After carefully taking off the latter, the skins are returned to the lime-pit, for two or three weeks, when they are again rinsed, and passed repeatedly through a decoction prepared of 30 lbs. of dog's dung, and an equal quantity of water. As soon as the skins are thus gradually impregnated, they are thrown into a large vessel for the space of 12 hours, after which they are cleaned with pure water, and immersed for seven or eight days in an acidulous decoction made of bran fermented.

The skins are now wrung, and thoroughly washed in clear water, to render them soft and pliable: next they are turned inside out, and sowed up like a bag and filled with sumach leaves: they are then put into a wheel with a rim about 18 inches broad, with water at the temperature of 100° of FAHRENHEIT. In this they are occasionally turned during 24 hours: after being thus turned, they are washed: sometimes a small proportion of bruised Aleppo galls are added to the sumach: then they are cured, by spreading a layer of common sea-salt, in the proportion of about a quarter of a pound to each skin, and piling them up, till they are rendered sufficiently supple. The last process which the skins undergo, previously to being dyed, is immersion in a liquor prepared by boiling some treacle in water, in which they remain till they are about to be suspended in the air for drying: lastly, they are dipped in a solution of alum and tartar that disposes them for the immediate reception of the dye. About 3 oz. to each skin of alum, and one oz. of argol, or crude tartar.

The chief colours communicated to Morocco-leather, are *red* and *yellow*, for the preparation of which, the Turks have long been celebrated.

The *red* colour is prepared by mixing together various articles, in the following proportions, which are required for a parcel of 36 skins:

	Drachms.
Cochineal - - - -	150
Berberry root - - -	50
Gum-arabic - - - -	10
Bark of the pomegranate-tree	10
Common water - - -	120 lbs.

Which are thrown into a copper, where they should be simmered for about two hours, till one-tenth part of the water be consumed. In this mixture the skins are repeatedly immersed; and, when sufficiently imbued with the colour, they are dried, and again steeped in a vessel, containing 20 pounds of warm water (for every 15 skins) together with one pound of sumach, and 2 oz. of gall-nuts, pulverised and sifted. As soon as the skins are completely impregnated with this liquor, they are slightly rubbed over with a sponge dipped in pure water, and suspended, without being folded, on a wooden frame, for about three quarters of an hour, to drain. They are now carried to a river, or in running water, where they are repeatedly rinsed, then pressed with weights, in order to extract the moisture, and hung up in a warm room to dry. The last process which red Morocco leather undergoes, is that of polishing: this is effected by means of various wooden instruments, that contribute at the same time to remove such of the particles of gall and sumach as may adhere to the skins.

The *yellow* colour is prepared in a manner nearly similar to that just described; the common Avignon or yellow berries (*Graine d'Avignon*) being substituted for cochineal, and employed in similar proportions.

The only variation between the two processes of dyeing *red* and *yellow*, is, that the former is tinged with the colouring matter, before it is *worked*, or polished with the wooden instruments; whereas this operation is performed on the latter, previously to its being dyed. But these two are not the only colours dyed by the Turks, who likewise manufacture black, green, and blue leather; which last three, however, are not only destitute of lustre, but are extremely perishable. The Turks, indeed, are as inferior to Europeans in preparing the more common species, as they excel them in manufacturing and dyeing the red and yellow moroccos.

[Such is the best account we can give of this process, but different manufacturers vary greatly in their modes. Mrs. GUTHRIE's travels in the Crimea, contains a very good account of the process there used. The peculiar odour of Russia leather, she says, is given by the *artemisia annua*, (*odorata*).—T. C.]

MORSE, the GREAT, or ARCTIC WALRUS, (*Trichecus rosmarus*) is a marine quadruped of enormous size, with short fin-like feet, two great tusks pointing downward from the upper jaw, the lips very thick, the upper lip cleft into two large rounded lobes, and no front-teeth in either jaw.

These animals inhabit the sea near the northern parts of the coast of America, and feed on sea-weeds, corallines, and shell-fish. They are sometimes nearly eighteen feet in length, and ten or twelve in circumference. Their skin is of dark colour, and thinly covered with short brownish hair. They have small eyes, and small circular orifices in place of external ears.

We are informed that these animals, under the name of horse-whales, were objects of pursuit so early as even the reign of King Alfred, on account chiefly of their *tusks* and *oil*. The former are a close-grained kind of ivory, and weigh from ten to near thirty pounds each; and the latter, which is equally valuable with that of whale-oil, is in such abundance that the body of each animal yields nearly half a tun. This oil is burnt in lamps, is used for the same purposes as whale-oil, and even eaten by the inhabitants of Greenland with their food. Of the *skins* of the arctic walrus these people make a thick and strong harness for their sledges and carriages; and they sometimes twist narrow strips of them into cables, which are upwards of sixty ells in length. They constitute an important article of export from the coast of Labrador. The tendons of these animals are split and used as thread.

So numerous were the arctic walruses formerly in the northern seas, that we are informed of the English, in 1706, having killed on Cherry Island (betwixt Norway and Greenland) near 800 in six hours; and that in 1708 they killed 900 in seven hours. Of late years, however, their numbers are much decreased.

As soon as these animals are killed, the teeth are separated with a hatchet; and the blubber, being cut into long slices, is put into barrels, and carried on board the vessels which are waiting to receive it.

MORTAR, a preparation of lime and sand, mixed with water: it serves as a cement, and is employed by masons and bricklayers in erecting walls, houses, &c.

Mortar being an article of extensive utility, it becomes an object of considerable importance to discover such a method of preparing it, together with such materials, as will perfectly cohere, and at the same time resist the action of the weather: we have therefore drawn up the following account.

[It is essential to good mortar, 1st. That the lime be burnt so as to reduce twenty parts by weight to eleven parts. 2d. That it be used as quickly as possible. 3d. That if it cannot be used quickly, it should be packed up when slacked in the smallest possible compass, and covered from the contact of successive changes of air. 4th. That to fresh lime, seven parts of sand are not too much: lime half burnt will not cement more than three parts. Hence the threefold extravagance of not using lime in a proper state: the lime is wasted: the weight of carriage is increased by hauling limestone instead of lime: and more lime is required to the same quantity of sand.

Though not essential to good building, it is very nearly so, that the brick (always supposed to be *well burnt*) should be dipt in lime water the *instant* before it is laid. The dust on a dry brick effectually prevents the adhesion of the mortar; and the brick also absorbs so much of the moisture of the mortar, that enough is not left to enable it perfectly to crystallise. Immersing the brick in lime water, makes it also less liable to imbibe moisture. It forms an impregnation of limestone.

When the lime is good, no addition of skimmed milk, animal jelly, oil, or resinous substances, or any other, contributes to the goodness of the mortar: good lime, and good sand, are the only requisites.

The putting beams and rafters, or any other method of shaking the wall, and greatly disturbing the crystallisation of the mortar while damp, injures its power as a cement.

In countries where limestone and fuel are plenty, and labour cheap, the ancient method of building walls by *grouting*, may be eligible. It is this:

The foundation being dug out the required width, in proportion to the thickness of the wall, a strong frame of boards was placed on each side. The space between the boards filled up with any kind of stone most convenient and at hand, thrown in promiscuously. The interstices of large stones, were roughly filled in with smaller ones. Mortar made from fresh burnt lime and fine sand, being made into a paste sufficiently thin to be poured, was poured in upon the loose stones, and thus filled up every crack and crevice. In a few hours, the boards were moved forward to form a caisson for another part of the wall, and the joints of the stones where the grouting had exuded, were trimme off. Many of the strongest and most durable of the very old buildings in England, were manifestly so constructed.

Where work is intended to be solid and substantial, grouting at every course is indispensable. It is indispensable also in all arch work: in England, it is never omitted in arches. It never ought to be omitted in such cases, or n cut groin-work.

Brick-work in cellar walls, or cellar arches, never dries if the mortar be not good, and used fresh, before it has become effete.

All these remarks are still more essential in the building of public works, as fortifications, than in private dwellings. By attending to these directions, a wall of equal thickness will have more han double the strength it usually has, built in a common way: and the mortar or cement, moreover, will harden ncomparably sooner. Water used to make a paste of pounded limestone (common mortar) and sand, can only be gotten rid of, from the middle of a thick wall by the slow evaporation of many years: but if the lime be really lime, and well and recently burnt, all the water, even of grouting, is rapidly consumed as water of crystallisation.

For *Stucco*, bone ashes well burnt and sifted, in the proportion of from one-half to one-fourth of the lime, is an addition useful to prevent the cement from cracking, without impairing its other good qualities; and this whether for inside or outside work. For the latter the proportion ought not to be of bone ashes more than one-fourth.

Water Cement is made, on the continent, by mixing with good mortar the ochry earth Puzzuolana, or a similar earth, called Traas, or Terras, in England, where it is imported from Holland. It is mixed accurately with the mortar, in proportion of about one-third or one-fourth of the lime. It is obvious that if precautions are necessary, in any case, to secure good and perfect lime, they will be necessary in the case of water cement.

I believe that the same proportion of almost any oxyd of iron, or of manganese, or even of the common smithy-slack of a blacksmith's shop, well sifted, will answer the same purpose. So will basalt, burnt and ground.

LORIOT's patent for water cement consists alone in the mixing of ground fresh burnt lime with common mortar, which is manifestly imperfect and unscientific; inasmuch as old effete mortar can never be equal to fine quartzose sand.

HIGGINS's patent stucco is, fresh well burnt lime one part; sand, half fine, and half rather coarser, well washed from dirt and clay, six or seven parts; I think six parts best; bone-ashes, ground tolerably fine, equal to one-fourth of the lime. The water used must be lime-water. For inside work, the bone-ash may be in proportion of a third of the lime.

JOHNSON's patent stucco was characterised merely by an admixture of blood with the water used to make up the cement.

I regard HIGGINS's as the best. I have seen them all, both fresh used and many years afterward.—T. C.]

In the year 1777, was published (in French), an ingenious "*Inquiry concerning the Manner in which the Romans prepared the Lime they used in Building; as also on their method of mixing and using their Mortar*;" by Mr. De LAFAYE. The principal circumstance appears to be the mode of slacking the lime without liquefying it, so as to reduce it to powder; and at the same time to leave it sufficiently caustic to yield a strong mortar; which, in proportion to its age, will acquire additional strength. To effect such object, it is requisite to select good fresh lime, made of hard lime-stone, which is to be broken into pieces of the size of an egg. These should be placed in a shallow open basket, which ought to be plunged into water, till the surface of the fluid begin to boil. The basket is then drawn out, and suffered to drain for a short time; after which the lime is put into casks, where it speedily grows hot, and crumbles into powder.

The lime thus prepared, is to be mixed with various compositions of mortar, according to the purposes for which they are designed. It may be preserved for a considerable time, and will retain its useful properties, by simply covering the casks with straw. M. GUYTON states, in a late volume of the *Annales de Chimie*, that he employed this lime, 18 years since, in the construction of a small aqueduct, which was intended to convey water to an artificial nitre-bed. The mortar consisted of equal parts of the following three ingredients, namely, sand, fragments of calcareous stone, and lime slacked according to the directions above given: in a short time it acquired an uncommon degree of firmness, which has remained unimpaired since that period.

The propriety of the above directions of Dr A. were confirmed by the experience of the building committee of the permanent bridge erected over the Schuyikill at High-street, who informed the public in their publication respecting the progress of the work, that the mortar used in cementing the stone work, was made by "throwing sand into a bed of the wash of slacked lime, which then received an addition of sand, till brought to its proper consistence for use." The proportions were three parts of coarse sharp sand, and one part of lime: richer mortar was found to diminish the strength of the cement.

On the subject of making mortar, Dr. A further says; it is of importance that much water should be used, and that it be retained as long in the mortar as possible, and accounts for the superior strength of the ancient mortar from its greater fluidity, and the slow manner in which it dried.

2. It is impossible to ascertain the due proportion of sand for making the most perfect cement, owing to the more or less degree of calcination of the limestone; and it may be added, the quality of the sand used; which varies very much.

3. The best modern mortar Dr. A. ever saw, was made of lime, which he had analysed, and found it contained eleven parts of sand to one of lime; to this there was added between twice and thrice its whole bulk of sand by measure, which may be allowed to have been at least three times its quantity by weight; or, not less than 47 parts of sand to one of lime. This mortar was used for pinning the outside joints of the stone walls of a house, in a tempestuous climate, and in 21 years exhibited no appearance of falling.

[I cannot give credit to this. *Fresh* burnt, and *well* burnt lime, will require seven parts of sand and no more, if used immediately. If to such lime be added one quart of molasses to each pailful of water, and one peck per bushel of smithy-slack, or powdered oxyd of iron of any kind, a very good water cement will be formed. Manganese may be substituted for oxyd of iron.—T. C.]

4. When lime is to be employed for *plaster*, every particle of limestone should be slacked before it is worked up, as the action of the water upon the undissolved particles of lime would slack them, and produce the excrescences, called blisters. Hence the lime, if impure, should lie for a time macerating in water, before it is worked up.

Pure, well calcined limestone will soon fall, but this macerating, as it is called, should never be omitted. This process, though not essential in making *mortar*, is still of use, as any dry knots which may fall after the mortar is used, must tend to disunite the parts, and render the cement imperfect. The best burnt lime required two days to macerate in the water, if required for plaistering walls.

MORTGAGE, in law, a pledge or pawn of lands, tenements, &c. for money borrowed; so called, because, if the money is not paid at the day, the land dies to the debtor, and is forfeited to the creditor.

MORTIFICATION, or *Sphacelus*, in the animal economy, is generally defined to be a total extinction of the natural heat of the body, or rather of a peculiar part, in consequence of inflammation.

Mortifications of the external parts, such as the legs and feet, more frequently occur in debilitated persons, and those who are addicted to the use of spiritous liquors: or in the aged, gouty, scorbutic, &c. than in the young and robust.

Peruvian bark, wine, opium, and other stimulants, are generally associated with the idea of mortification, and when it occurs in debilitated habits, they are certainly proper; but in vigorous habits, or in persons of inflammatory dispositions, the best way to prevent mortification is to lessen the excessive action of the system, by moderate bleeding, cooling saline purgatives or clysters, and light diet.

The internal administration of stimulants, where necessary, will be greatly assisted by their external application. In the edition of the *Surgical Tracts* of the late Dr. John Jones, Philadelphia, 1795, p. 137, Dr. Mease has recorded a remarkable instance of the efficacy of Peruvian bark, in powder, to a mortified limb, and confidently recommends it. A poultice of flour, honey, yeast and charcoal powder, is also commonly used, and with success, in removing the fetid smell of wounds, ulcers, and mortifications.

MOSCHATEL, the Tuberous, or *Adoxa Moschatellina*, L. an indigenous perennial plant, growing in damp woods, and shady places, where it flowers in the months of April and May. The ripe fruit of this low plant has the flavour of strawberries. The plant itself possesses the odour of musk, for which it may serve as a substitute in chests or drawers, among clothes. Its root was formerly in repute among the vulnerary herbs.

MOSS, in *Botany*, a term for a numerous family of plants, which may be called the dwarfs of the vegetable kingdom.

Mosses were formerly supposed to be a mere excresence from the earth and trees, yet they are no less perfect plants than those of greater magniude, having roots, flowers, and seeds, hough no art has hitherto been discovered, to propagate them from the eed.

They are spread over the whole globe, so that in some situations the soil is exclusively covered by mosses; and thus frequently bare rocks gradually become fertile. As they grow most copiously on the north-west side of trees, it is probable that mosses serve to protect them from the severity of cold; but if these parasitical plants be suffered to increase too abundantly, hey not only tend materially to injure trees, but also to stifle the more useful vegetables of the soil.

Mosses are almost constantly green; have the finest verdure in autumn; and, though kept in a dry place for a whole century, they may be revived, and their colour restored, by immersing them in water.

Dry moss is the most proper substance for mattresses, and greatly superior to straw; as it is not liable to be infested with mice, bugs, fleas, &c. When such couches become hard by compression, they may be easily raised again and rendered soft, by beating them with sticks. For this purpose, however, the longest and softest mosses ought to be collected, in September, during dry weather; then cleansed from all impurities and woody roots; dried in the shade; and again agitated with a stick, on a hurdle. Next, the mattress is to be stuffed eight inches thick, and quilted in the usual manner. Nor is this soft substance less useful for packing glass, earthern ware, and other brittle articles, in preference to straw or wood shavings.

Among the numerous *mosses* which are subservient to economical purposes, we shall at present only mention a few of the most useful; because others are inserted in their alphabetical place.

1. *Fontinalis antipyretica*, or GREATER WATER-MOSS, which grows upon rocks and roots of trees; in brooks, rivulets, slow streams, and ponds: it flowers from June to September. According to LINNÆUS, this species resists the action of fire: and, if mixed with mortar for lining the inside of chimnies, it renders them *fire-proof*; as, contrary to the nature of all other mosses, it is almost incombustible. BOHMER also remarks, that a thatched roof, if covered an inch thick with the greater water-moss, will be completely secured against fire.

2. *Bryum rurale*, which grows on roofs, both thatched and tiled, walls, and trunks of trees: it is perennial, and flowers from December to April. Thatched buildings overgrown with this moss, instead of lasting about ten years, will remain sound for a century.

3. *Sphagnum palustre*, or GREY BOG-MOSS, which is also perennial, and flowers in July and August. This species materially contributes to the production of peat or *turf*; so that in process of time, bogs and morasses are converted into beautiful meadows. In Norway, it is employed for filling up the crevices of planks in wooden walls; and though it be sometimes used for a similar purpose in tiled roofs, yet as it affords shelter to vermin, we conceive it might more safely and advantageously be applied behind the stones or brick-work of wells, to prevent the clay or loam from being wasted by the action of the water.

4. *Byssus candelaris*, L. (*Lichen flavus* of WITHERING) or YELLOW POWDER-WORT; an annual vegetable dust generated on old pales, the cracked bark of trees, and antique walls in all parts of the world: it appears from September to June. This powdery substance may, according to BOHMER, be employed for dyeing a very bright yellow colour.

5. *Lycopodium clavatum*. See CLUB-MOSS, the Common.

MOSS, in *Horticulture*, is a disease which greatly impedes the growth of trees, and at the same time very materially injures the fruit of orchards.

The remedy usually employed is, to scrape off the moss with a kind of wooden knife, that will not wound the bark or branches; or to rub them with a strong hair cloth, immediately after a heavy shower of rain, But the most effectual method, in Mr. BUCKNALL's opinion, consists in washing all the branches with soap-suds, and a hard brush, every spring and autumn. The action of rubbing, he observes, will so far invigorate the tree, as amply to compensate both the labour and expense: the plant will not be injured by this operation, which he directs to be performed in the same manner as a groom curries or scrubs the legs of a horse. (Moist weather should be chosen for this business, as the moss may be then easily disengaged.) The most efficacious preventive, however, is to remove the cause, by draining all superfluous moisture from the roots; and, when the trees are first planted, by placing them on the surface of the ground, and raising a small mound of good fresh mould around them.

The moss, vegetating on shrubs, &c. is of various kinds, according to the nature and situation of the soil. If the young branches of trees be covered with long and shaggy moss, they will speedily perish: and can only be preserved by cutting them off near the trunk; or, by lopping the head of the shrub, &c. if it be found necessary; as it will sprout again with increased luxuriance. In thick plantations, however, and in a cold ground, the trees will always be covered with moss: in such cases they must be thinned, and the land drained, or well stirred.

Where shrubs, fruit-trees, &c. are covered with moss, in consequence of the soil being *too dry*, it will be useful to spread large quantities of river or pond-mud about the root, and to open the ground for the admission of the manure: such expedient will not only cool the land, and greatly suppress the future growth of moss, but at the same time prevent the fruit from falling off too early—a circumstance that frequently happens in orchards planted in very dry soils. Mr. FORSYTH advises moss to be carefully removed in the months of February or March; after which the scraped trees must be washed with a mixture of fresh cow-dung, urine, and soap-suds. If this operation be repeated in autumn, when the trees are destitute of leaves, it will not only prevent the production of moss, but will also destroy the eggs of numerous insects, that would otherwise be hatched; while it contributes essentially to promote vegetation. But, though moss be in general destructive to the vegetation of shrubs and trees, yet, if growing only on the *north side* of their trunks, it is attended with considerable advantage; insomuch, that it serves both to shelter them from the severity of the north winds, and also to direct the wandering traveller in his course; because it always points out that quarter of the compass.

MOSS, the MARSH, or *Mnium*, L. a genus of perennial plants, comprising 32 species, most of which are natives of Britain. The following only deserves to be mentioned, namely, the *fontanum*, or Fountain Marsh Moss: it grows in low wet meadows, turf-bogs, and springs; where it flowers from May till August. This kind of moss, which may be seen at a considerable distance, serves as an excellent guide for discovering clear and cold springs: wherever it thrives, fresh water may be found, without the trouble of sinking deep wells.

MOSS-LAND, an expression used in Scotland, and also in various parts of England, for denoting what is more properly called a MORASS, *BOG or FEN*.

MOTH, or *Phalena*, a genus of insects comprehending several hundred species, which it would be needless to enumerate: they are uniformly bred from eggs, and are no sooner hatched than they construct for themselves a small habitation, in which they live; and may thus be easily distinguished from other insects, which do not form their *chrysalis* till they are about to change from a caterpillar state into that of a butterfly.

Most moths become nocturnal butterflies; though some species of these vermin, being real maggots, assume the shape of flies; and others that of chafers.

With respect to their abode they are divided into *domestic*, *field*, and *aquatic moths*. The first is the small lead-coloured moth, that lives on fine furs and woollen goods, by the destruction of which it often occasions considerable damage: the two latter kinds prey on the leaves of trees, the fibres of wood, bark, &c.

The butterflies of the domestic moth are scarcely half an inch in length, and have four long wings that cover the whole posterior part of their body. From the early spring to midsummer, they infest our dwellings, and during the night search for convenient places to deposit their eggs, which are scarcely discernable by the naked eye. These are hatched within three weeks, and produce very diminutive caterpillars with sixteen feet, and which immediately begin to weave, for their accommodation, a thin silken cover from their own substance, not unlike the silkworm, and then gnaw off the wool and hair from the stuffs on which they are settled. Thus arises a cylindrical texture which, being open at both ends, is gradually enlarged with the growth of the insect. In order to extend this fabric, the caterpillar divides it longitudinally into two parts; weaves an intermediate piece between each section; and joins to both ends a small portion for enlarging its abode. The whole as externally the colour of the stuff rom which it is taken, and the sub-tance of the latter affords sustenance o the insect.

In this state, they remain nearly a vhole year, and during that period reatly injure clothes or other articles anufactured of wool; though these estructive creatures fast for many lays (probably when changing their kin), and also spend the whole winter n a torpid state. In the succeeding pring, they entirely close their case; hange into a chrysalis; and, after a ew weeks, appear in the shape of *moths*, vhich speedily propagate themselves n the manner of bugs. Some species, owever, previously desert their habi-ation, and suspend themselves, in the ext convenient corner, where they un-lergo their transformation.—There is a eculiar kind of these vermin, called *astard-moths*, the cases of which are pen at one end; closely attached to voollen cloths, and removed only when hey have devoured the whole substance round the spot: they are of a larger ize than the true moths.—Another ariety of the latter kind, preys only n the dry skins of animals, the leather overs of books, &c. but their cases are estitute of all motion.

It is remarkable, that moths never nfest the fleeces on the backs of ani-nals; nor even *unwashed wool;* so that hey always abandon the place where uch raw material is kept. Hence hose persons, to whom the smell of urpentine is too offensive, may avail hemselves of this circumstance, and lace layers of undressed wool between ieces of cloth, or put small parcels in he corners of shelves and drawers con-aining drapery of that description. For he discovery of this curious and useful act, we are indebted to M. REAUMUR.

Another, though more disagreeable mode of exterminating moths, is the moke of tobacco, which infallibly kills hem; but the articles thus fumigated hould be afterwards exposed to the ir, which speedily dissipates the pecu-liar smell of that narcotic herb.

Preventives against the Ravages of Moths.—The most usual preventives against the injury occasioned by the moth, are cedar-wood and tobacco leaves. A piece of the former put into a box, if sufficiently large to emit its peculiar odour to whatever may be contained in it, will effectually preserve the cloth from injury; and it is well known that in libraries where there are books bound with Russia leather, which is tanned with cedar, no moth or worm will corrupt. It is common to put cedar shavings and chips into boxes, &c. which answer just as well as the wood itself.

Tobacco leaves may be placed at certain invervals in the folds of a piece of woollen cloth; and it is sufficient to examine them once in six months, in order to renew the leaves if necessary. Or camphor dissolved in whiskey may be used.

MOTHER OF PEARL, a beautiful white enamel, which forms a part of the oyster-shell. See PEARL.

MOTHERWORT, the COMMON, LION'S TAIL, or *Leonurus Cardiaca*, L. an indigenous plant, growing in hedges, rubbish, on dunghills, and calcareous soils; flowering from June till August.

The leaves of the motherwort possess a strong disagreeable odour and a bitter taste.—Goats, sheep, and horses, eat this vegetable, but cows do not relish it; and it is totally refused by hogs.—DAMBOURNEY dyed woollen cloth of an excellent dark olive colour, from a decoction of this plant.

MOTION, the continued and successive change of place. There are three general laws of motion. 1. That a body always perseveres in its state of rest, or of uniform motion in a right line, till by some external force it be made to change its state: for as a body is passive in receiving its motion, and the direction of its motion, so it retains them, or perseveres in them without any change, till it be acted on by something external. 2. that the change of motion is proportional to the force impressed, and is produced in the right line in which that force acts. 3. That action and re-action are equal with opposite directions, and are always to be estimated in the same right line. See MECHANICS.

MOULD, a general name for the soft earthy substance that serves as the upper stratum of land; and in which all kinds of vegetables strike root and thrive, and which is more or less mixed with decayed vegetable and animal substances.

The relative utility of mould, for the different purposes of the gardener, may be ascertained by the sight, smell, and touch. The best is of a light brown or hazel colour; it cuts easily, and does not adhere to the spade, being light, friable, and crumbling into small clods. The next in quality are the dark-grey and russet-coloured moulds; but the worst are those of a very light, or very dark ash-colour, such as are generally found on barren heaths and commons, where they seldom produce any thing except furze and fern.

With respect to smell, MILLER observes, that the best time for judging by that sense, is immediately after rain has moistened the soil; when the mould, if it be rich and good, will emit an agreeable odour. But the most accurate criterion is the *touch;* as it may thus be ascertained whether the mould be too sandy, or abound with too much clay; whether it be fatty and slippery; or harsh, porous, or friable. The most fertile, by this test, holds a medium between the two extremes; being easily soluble, consisting of equal parts of sand and clay; and not adhering to the spade, after gentle showers.

[MOUNTAIN. These protuberances on the earth's surface are manifestly formed by the action of subterranean fires and earthquakes, operating generally below the granite stratum, and between the crust of the earth and the nucleus. Hence the remains of marine animals found in the limestone and other strata. For the heights of mountains, see MINERAL KINGDOM.—T. C.]

MOUSE, or *Mus*, a genus of quadrupeds, being the order *Glires* of the *Mammalia*, comprising sixty species, of which the following are found in Britain, namely:

1. The *sylvaticus*, or Long-tailed Field-mouse, the length of which is in general from eight to nine inches, including its tail.—These animals are found in fields, gardens, and shrubberies, where they do incalculable damage; burrowing under the ground, and digging up grain, acorns, peas, beans, &c. when newly sown; which they carry to their subterraneous granaries. Their habitations may be discovered by the small mounds of earth, that are raised on, or near, the entrance of their abode; or by the passages leading to their nests, or store-houses; and, by following the course of such passages, the vermin may be easily destroyed.

Another method of extirpating field-mice, is by traps, consisting simply of a flat stone that is supported by a stick; and beneath which is placed a roasted walnut. They are speedily attracted by the smell of the walnut, which they prefer to acorns or cheese; and, as it is fixed to the stick, that yields as soon as it is touched, the stone falls upon them, and terminates their existence. But the most effectual mode of destroying these animals, would be to encourage the breed of owls, which is so active in the pursuit of nocturnal vermin.

2. The *messorius*, Harvest, or Smaller Long-tailed Field-mouse, which is by some considered as a variety of the former species; and is very small and slender; its whole length, together with the tail, not exceeding 4½ or 5 inches. This creature constructs its nest of a circular form, with blades of corn, which it deposits above the surface of the ground between the straws of standing grain, and frequently in thistles, where the female produces from six to eight young ones at a time.

The harvest-mice never enter houses; but are often carried into ricks, among sheaves of corn; *one hundred* having sometimes been found in a single rick, on taking it down to be housed. Those remaining in the field shelter themselves during the winter beneath the ground, into which they burrow deeply, forming their beds or nests of decayed grass. They may also be taken by means of the traps above mentioned.

3. The *musculus*, or Common Mouse, which has a very long scaly, and almost naked tail; exclusively of which, it is about three inches and a half in length. This species is uncommonly prolific, producing several times in the year, five or six young at a litter.

There are several varieties of the common mouse, which are chiefly distinguished by their colour, such as black, yellowish, spotted, &c.; but the most rare and beautiful are white, with red eyes. They are in some degree capable of being tamed, especially by means of music, to which all mice are singularly attached.

The common mouse inhabits all temperate climates, and is chiefly found in houses and in barns, whither it resorts for the sake of food, devouring grain, bread, cheese, butter, oil, &c. It is exceedingly timid, and very nimble; never leaves its abode excepting for food; and retires on the slightest alarm.

These little depredators may be destroyed in houses by the common traps, baited with cheese; in barns it will be necessary to allure them by means of singed leather, grease, or other animal food: and, in chambers where cheese is preserved with malt-meal. As, however, all these methods are troublesome; and, as the exposing of poisonous substances may be attended with danger, we shall communicate a remely that is both safe and efficacious: Take a few handfuls of wheaten flour, or malt-meal, knead it into a dough, and let it grow sour in a warm place; hen mix with it finely levigated iron ilings, form the whole into small balls, and put them into the holes frequented by mice. On eating this preparation hey are inevitably killed.

Another way to extirpate them is, by keeping cats, dogs, owls, or hedgehogs, in the places infested with mice or rats. But the most effectual method of preventing their devastations in barns, the floors of which they frequenty undermine, consists in laying beneath the latter a stratum of flints, ragments of glass mixed with sand, or broken cinders. It has likewise been proposed to construct such floors on piers of brick, raised about 15 or 18 nches above the ground, so that dogs or cats may have a free passage beneath the building. See also Corn, and Mullein.

4. The *arvalis*, or Meadow-mouse, is from three to six inches in length; dwelling in bushy places, corn-fields, meadows, and gardens, chiefly near waters. It subsists on nuts, acorns, peas and grain, which last it prefers to every other kind of food, collecting considerable quantities in its subterraneous residence.

As soon as the corn is ripe, the meadow-mice assemble together in corn-fields, where they commit great ravages, by cutting down the stalks of corn with their teeth; and robbing the ears; nay, they follow the reapers, consume all the fallen or neglected grain, and, when the gleanings are devoured, they flock to the newly sown fields, and destroy the crop of the succeeding year. Being very prolific, the females produce from eight to twelve at a litter, several times in the year. During the winter, they retire to woods, coppices, &c. where they subsist on acorns, hazel-nuts, and the seeds of trees.

In some seasons, the meadow-mice become so numerous, that they would consume every esculent, if they did not destroy each other. Hence, in unproductive years, their numbers are greatly diminished, not only by devouring their own species, but also by becoming the prey of the long-tailed Field-mice, of foxes, wild cats, weasels, and especially of dogs.

[In England, mice, rats, and birds, consume one-tenth of the whole grain of the kingdom; and the clergy nearly another tenth. Rats and mice are easily poisoned by arsenic; but their dead bodies are offensive.—T. C.]

MOUTH, in anatomy, a part of the face, comprehending the lips, gums, inside of the cheeks, palate, &c.

The mouths of different animals are admirably adapted to various uses, according to their size and nature; being well formed and calculated for the reception and mastication of food, the seizing of prey, &c. It would however be incompatible with our design, to enter into any details relative to the organisation of this part; we shall, therefore, concisely state only a few of the diseases incident to the human mouth.

1. Affections of the Teeth, and Gums, which are discussed in their respective places.

2. Cancers, which see.

3. If the mouth be affected with excruciating pain, the internal application of opium will afford considerable relief. But, if any tumours or swellings arise, it will be advisable to apply externally cataplasms of marsh-mallow, and other emollient vegetables, or poultices of bread and milk. When the tumefied parts continue very painful, without suppurating, it will be proper to lance them, in order to reduce the swelling. The patient ought, at the same time, to avoid speaking; and to take no such food as is either of an acrid and stimulating nature, or requires any efforts of mastication. Hence, he ought to subsist principally on liquid, mucilaginous aliment; and his drink should be sweetened with honey, which in itself is one of the best balsamics. See Gargle.

MOWING, the act of cutting down grass, &c. with the scythe.

This method of reaping has hitherto been practised chiefly on oats, clover, and the grasses; but there is no doubt that it may, with advantage, be extended to wheat, and every other kind of grain, for the following obvious reasons: 1. Mowing is much easier, and less fatiguing to the labourers than reaping. 2. It is more expeditiously performed. 3. It requires a smaller number of hands. 4. It affords employment for children, aged men and women, who are almost past labour, in gathering the corn, and other lighter branches of the work. 5. The grass being mown together with the straw, the quantity of the latter is increased, while it becomes of greater value as fodder. Lastly, the grass produced on fields which have been mown, vegetates with increased luxuriance, and furnishes excellent pasture for cattle, and particularly for cows, when the harvest is closed. Hence DUHAMEL infers, that a farmer may, by this practice, not only keep a larger number of cattle, but at the same time save his hay, and obtain a greater quantity of dung.

It may probably be objected, that, if a wet harvest should occur, *mown wheat* will sprout more speedily than that which is *reaped*. This injury, however, may be effectually prevented, by disposing the sheaves *triangularly*, so that the head of one may rest upon another. The only requisite to effect this, is a little dexterity in closing the triangle, so that the basis of the third sheaf may serve to support the heads of the first and second.

We cannot conclude this article, without noticing an easy method, by which the operation of mowing may be greatly facilitated. According to the present mode of cutting grass, the workmen trace *two parallel lines* with their feet, which they move forward alternately, after every stroke of the scythe: instead of which, DUHAMEL recommends the mower's path to be traced *only in a single line*; because he ought to advance with one foot before the other, in such a manner that the left (which is behind), should always forward the right foot. This simple practice deserves commendation, for the labour will not only be performed with more speed, but likewise with greater ease to the mowers, who will thus be secured from those sudden cramps in their left sides, with which they are frequently seized, in the prevailing system of using the SCYTHE.

MOWING-MACHINE. Mr. MOSES COATES, whose ingenious contrivance to pare apples, was described under the article FRUIT, has also invented a mowing-machine, which promises to be of extensive utility to farmers. It is drawn by two horses, and takes a swarth four feet nine inches wide, as fast as the horses walk: but he thinks it would work a swarth six feet wide, to better advantage. It cuts grain uncommonly clean, not leaving one stalk standing, nor dropping one by the way, and at the same time lays the grain in regular order for the binder. The irregularity in the surface of most grass fields prevents the general application of the machine to the cutting of grass, but where this difficulty does not occur, and the ground is clear of stones, it answers fully. Dr. MEASE was favoured by the inventor, with a general description of this *labour-saving machine*, but deemed it unnecessary to give it, as persons wishing to possess one must apply to the inventor, to whom letters may be addressed, at DOWNING'S-TOWN, *Pennsylvania*.

MUD, the slime or miry earth usually found at the bottom of ponds, and stagnant waters. It also signifies the dust or dirt of streets and roads, rendered fluid by rain.

Mud is chiefly used as a manure for *loamy* soils; though it may also be applied with advantage to any other land. The best kind is that taken from ponds which have received the draining of farm-yards. The sweepings of streets have likewise been found of considerable service, when mixed with a little horse-dung, in order to ferment, before it is carried on the land. Thus prepared, it has been spread in the proportion of ten or twelve loads per acre, and been productive of the most beneficial effects. See MANURE.

MUGWOT, or *Artemisia*, L. a genus of perennial plants, comprising 49 species, five of which are indigenous: among these, the following are the principal.

1. The *maritima*. See WORMWOOD, the Sea.

2. The *absinthium*, MUGWORT, COMMON WORMWOOD, or WORMWOOD-SOUTHERNWOOD, growing on road sides, rocky places, and on rubbish; it flowers in August. This herb is extremly bitter; and, if it be infused in wort, as a substitute for hops, it renders the ale very pernicious to health, on account of its intoxicating effects. On distilling the leaves and flowers, they yield a considerable quantity of essential oil, which is used, both externally and internally, for destroying worms. If the leaves be put into sour beer, they speedily correct its acidity; and being excellent antiseptics, they are often employed in fermentations, to resist putrefaction. According to WITHERING, an infusion of these leaves is a good stomachic; and, with the addition of fixed alkaline salts, proves a powerful diuretic in some dropsical cases. Their ashes produce a purer alkali than most other vegetables. An infusion of the same herb, given to a suckling woman, renders her milk bitter; and, if the plant be eaten by sheep, it also imparts a bitterness to mutton. Although turkeys are fond of it (on the authority of Mr. HOLLEFEAR,) yet it is not relished by horses and goats, while it is refused by cows and swine. If the plant be macerated in boiling water, and repeatedly applied

to a bruise, by way of cataplasm, it will not only speedily remove the pain, but also prevent the swelling and discolouration of the part. In dyeing, a decoction of the Common Wormwood produces, with the addition of alum, &c. various shades of yellow; and, if such liquor be applied to bedsteads, chests of drawers, and similar articles, it prevents the generation of vermin. The smoke arising from the lighted bundles of this herb, expels bees from their hives, when honey is to be collected, without destroying these useful insects.

3. The *vulgaris*, **Common Mugwort**, or **Southernwood**, which grows on the borders of fields, ditch-banks, and on rubbish; it also flowers in August. This species possessing a more agreeable flavour, is in some countries used as a culinary aromatic: a decoction of it is often taken by country-people for curing intermittent fevers. The Chinese employ the fresh plant bruised, for healing wounds: and, according to Dr. Home, a drachm of the leaves, dried and pulverised, if taken four times a day, has effectually removed hysteric fits, after æther and asafœtida had failed of procuring relief. Dr. Anderson remarks that sheep are very fond of the Common Mugwort, devouring it with great avidity, especially the roots; though, according to Linnæus, these animals, as well as swine, totally refuse it; and horses, cows and goats do not relish it.

[To these ought to be added the *Artemisia annua odorata*, which according to Mrs. Guthrie's excellent account of the Crimea, gives the odour so peculiar to Russia-leather.—T. C.]

MULBERRY-TREE, or *Morus*, L. a genus of exotics, comprising seven species, of which only the *nigra*, or Common Mulberry-tree, is cultivated in Britain, on account of its black fruit.

It is propagated both by layers, and by cuttings, which last are preferable; because, when judiciously selected, and properly managed, they will speedily strike root. For this purpose, the cuttings ought to be taken from shoots of the preceding year, with one joint of the two years' wood at the bottom, and to be set towards the end of March, in beds of rich light earth, which should be pressed closely around them. If they be placed beneath glasses, their growth will be remarkably promoted; but if the young plants be exposed to the air, it will be necessary to shelter them from the severity of winter, with moss; a precaution, which at the same time renders it unnecessary to water them frequently. In the succeeding spring, they should be removed to the nursery, and trained to a stem; the more luxuriant branches being carefully pruned, to prevent their too rapid growth; and in the course of about four years, they may be finally transplanted to the place where they are destined to remain.

Mulberry-trees thrive best in a light, rich soil, and an open situation; for, if they stand too near houses or other buildings, or contiguously to shady trees, their fruit seldom attains to maturity. It will, however, according to the experience of Miller, be of considerable advantage to defend them from the west, and south-west winds, by trees, or walls placed at a small distance.

The fruit of this species, if eaten before it be thoroughly ripe, is very astringent; but its syrup affords an excellent gargle, for mitigating inflammations of the throat, and ulcers of the mouth. The berries when perfectly mature, are grateful to the taste; they produce both cooling and laxative effects, while they contribute to allay thirst. Their juice is employed to impart a dark tinge to liquors and confections, which stain the fingers as well as linen, of a red colour, that is very difficult to extract. Spots of this kind, however, may be removed from the hands by verjuice, the acid of sorrel, and that of lemons; but, for linen, the best method is to wash the stained part with warm water, and to dry it with the vapours of sulphur, which immediately remove the spot.

The fruit of the common mulberry-tree, when properly fermented and prepared, yields a pleasant vinous liquor, known under the name of mulberry-wine. Considerable quantities of these berries are likewise consumed in the cyder counties, particularly in Devonshire, where they are mixed with apples, &c. in making a delicious beverage, called *mulberry-cyder*. For this purpose, the ripest and blackest mulberries are selected, and the expressed juice is added to the cyder, in such a proportion as to impart a perceptible flavour. The liquor thus acquires a very pleasant taste, as well as a deep red colour, similar to that of the finest Port-wine, both of which continue undiminished by age.

The *bark* growing on the root of the Common Mulberry-tree, has an acrid bitter taste, and is a powerful *cathartic*:

hence it has been successfully used as a vermifuge, particularly in cases of *tænia*, or of the tape-worm: the dose is half a drachm of the powder, or a drachm of the infusion. The wood of the tree is yellow, tolerably hard, and may be applied to a variety of uses in turnery and carving. It is however, necessary to steep it in water before it is worked: in order to remove the tough and fibrous bark, which is capable of being converted into a strong cordage, ropes, and brown paper.

There are several other species of this tree (particularly the *alba*, or White Mulberry) which are cultivated to a considerable extent on the continent, for their mucilaginous leaves, that afford a most grateful food to silk-worms; but, as various unsuccessful experiments have been made with a view to introduce their culture into Britain, they are seldom raised, excepting by way of ornament, in the hot-houses of the curious. It deserves, however, to be stated, on the authority of Bechstein, and other continental writers, that the last mentioned species is better calculated to withstand the effects of severe frosts than the common Mulberry-tree; that it is, therefore preferably cultivated in the northern parts of Germany, for instance, Saxony, Brandenburg, Pomerania, and Prussia; where it thrives with uncommon luxuriance, if planted in a moderately rich, though sandy soil; and if properly sheltered from the cold north winds. This observation is amply confirmed by the considerable quantities of raw silk annually produced in the Prussian dominions from the leaves of that tree, which afford the most proper nutriment to silk-worms.

The white mulberry-tree thrives in the United States, and in Connecticut is much cultivated. The tree grows rapidly, and has been recommended for hedges. Cattle however are so fond of the leaves, that great care would be requisite to preserve the young trees from their depredations.

MULE, or *Equus Mulus*, a mongrel kind of quadrupeds, partaking both of the nature of a horse and an ass.

Mules are very hardy animals, and therefore much used in warm climates, where they are preferred to horses, for the purposes of either draught or carriage. Considerable numbers are likewise employed in Ireland, and in some of the northern counties of Britain, on account of their great strength and durability. [They are commonly used in North and South Carolina, as they bear heat and hardship better than horses do.—T. C.]

These animals sometimes attain the height of 15 or 16 hands, though in general, they do not exceed 14 They are calculated for carrying heavy burdens. They are, besides, sure-footed, and attain a great age; instances of mules thirty years old having occurred in Ireland, and which, nevertheless, were in the full possession of their vigour.

The mules bred in cold countries, are reputed to be more hardy, and fit for labour, than such as are reared in warm climates. Hence they deserve to be more generally propagated in Britain. For this purpose, however, it will be requisite previously to procure a strong male ass, and two females, which should be well fed, and kept in good order. Their colts ought, likewise, to be carefully attended, fed, and littered, being kept under shelter in the winter, and the stable-door left open in the summer, that the animals may exercise themselves in the air, for one or two hours, during the middle of the day. By such management, the breed of colts will be considerably improved; and, at the end of three years, the males will be fit for the purpose. The mares selected for the stud, should be young, of a lively turn, small limbed, and with a head of moderate size. These, with proper attention, will drop foals; each of which, at the age of three months, are said to be worth from ten to twenty guineas.

During the first winter, it will be necessary to *house* the mule colts, so that they may be frequently handled, in order to render them tractable. When three years old, they may be *broken in*, but it will not be advisable to work them to any considerable extent, till they have attained the fourth year of their age; after which time they will, if properly treated, continue in full vigour till they are past thirty, and even forty years. It should, however, be remarked, that *no wheat*, or *rye-straw*, ought to be given them for their food, *whether whole or cut;* as it greatly disagrees with their nature, and incapacitates them for performing hard labour.

Mule, a term which denotes any production, whether of the animal or vegetable creation, that originates from two different species.

Thus, beside the animals properly denominated *mules*, it appears that the different breeds of sheep may be advantageously *crossed*. Linnæus observes, that the breed from *Swedish* ewes and *Spanish* rams, resembled the Spanish sheep in wool, stature, and external appearance; but was, in all respects, as hardy as the Swedish sheep: the contrary effect resulted from the Swedish rams and Spanish ewes. He farther remarks, that the English ram *without horns*, and a Swedish *horned* ewe, produced sheep destitute of that ornament. These facts are equally curious and valuable: they require no commentary, to recommend them to the attention of breeders in general.

The *vegetable mules*, or hybrid plants, are very numerous; and by scattering the farina or fecundating dust, over female flowers, several excellent varieties have often been obtained. Thus, in the first volume of the *Letters and Papers of the Bath and West of England Society*, we meet with an interesting account of a *mule-cabbage*, which is said to fatten cattle six weeks earlier than *turnips*. The correspondent states, that the sort of cabbage principally raised, is the Tallow-loaf, or Drum-headed Cabbage; which being too tender to withstand the severity of the frost, he planted some of this species and of the common Purple Cabbage for pickling alternately: when the seed-pods were perfectly formed, he cut down the purple, and left the other for seed. The result completely answered his expectations; namely, the produce was a mixed stock, of a deep green colour, with purple veins; and which retained the size of the drum-head, while it acquired all the hardiness of the purple. This is one of the most successful experiments with respect to vegetable improvements: and, without quoting other instances, related in the subsequent volumes of the same valuable collection, as well as in other works, we trust these few facts sufficiently evince the practicability of the plan; and hope they will not be disregarded; because such attempts not only tend to enrich our *practical* knowledge, but at the same time afford additional proofs of the wisdom and beauties of the creation.

MULLEIN, or *Verbascum*, L. a genus of plants, comprising 17 species, five of which are indigenous: the principal of these are:

1. The *Thapsus*, Great White Mullein, High Taper, Cow's-lungwort, or Ladies' Fox-glove; growing on chalky and gravelly soils, and on dry ditch-banks; flowering in the month of July. Hochheimer informs us, that the roots, stalks, and flowers of this plant, after being properly cleaned of the adhering earth, and other impurities, have long been used in German granaries, where bundles of it are placed in every corner, and on the grain itself, in order to prevent the depredations of *mice*. It affords so complete a security from these vermin, (as is said,) even in barns, that they suddenly disappear, and shun the place for several years after this vegetable has been deposited. The flower of this, and the following species of the Mullein, impart a delicate, though not durable, yellow-colour, to wool and cotton; but, on the addition of blue, these stuffs acquire a blue shade of incomparable lustre. The woody stalks covered with pitch, make excellent flambeaux. The seeds when thrown into water inhabited by fish, produce an intoxicating effect, so that these creatures suffer themselves to be caught by the hand. Neither cows, goats, sheep, horses, nor swine, will eat this vegetable.

2. The *nigrum*, Dark, or Black Mullein, which grows in hedges, and on road-sides; is perennial; and flowers from July to September. This plant is justly admired for its beauty; the stem is covered with hairs elegantly branched, and has yellow blossoms tipped with purple. Bees visit its flowers, which to them are exceedingly grateful. Swine eat the plant; but it is neither relished by sheep, nor touched by cows, horses, or goats.

MULLET, or *Mugil*, L. a genus of fishes, consisting of two species, principally distinguished by the number of rays in the back-fin. Both frequent the sandy coasts of England, and particularly small bays that admit influxes of fresh water. Hither they resort in considerable shoals; and, similar to hogs, grub in the sand or mud, leaving their traces in the form of large round holes.

Mullets are extremely cunning: when surrounded with a net, the whole shoal frequently escapes by leaping over it; for, if one take the lead, the others instinctively follow: but, if they fail to effect their object, they remain motionless in the water, as if resigned to their fate.

In the South of France, abundance of these fish are taken in shallow water, by means of *weirs* constructed with reeds. From the milts of the males, called *alletants*, and the roes of the females, denominated *botar*, the inhabitants prepare a kind of food, called *botargo*. These parts are taken out entire, covered for four or five hours with salt, then pressed between two boards or stones, afterwards washed, and, lastly, dried in the sun for about a fortnight.

As an article of food, the mullet affords a tolerable dish, being more tender than the haddock, and less juicy than the carp: it is not, however, so delicious as the ancient Roman mullet, which appears to have been a different species.

MUM, a kind of malt-liquor, which is prepared in the following complicated manner: Seven bushels of wheaten malt, one bushel of oatmeal, and a similar portion of ground beans, are brewed in sixty-three gallons sf water, which has been previously boiled. The liquor is next poured into a hogshead; and, as soon as it begins to ferment, three pounds of the inner rind of fir, one pound of the tops of fir and beech, three handfuls of the blessed thistle, and one or two handfuls of the flowers of round-leaved sun-dew (*Drosera rotundifolia*, L.), are thrown into the vessel. To these are added a handful of burnet, and a similar quantity of betony, marjoram, avens, pennyroyal, and wild thyme; two handfuls of elder-flowers, thirty ounces of bruised cardamom-seeds, and one ounce of bruised berberries. The whole mash is now suffered to work gently for a little time, when the hogshead is filled up, and ten new-laid eggs are thrown in, unbroken; after which the vessel is closed, and, at the end of two years, the liquor is fit for use.

Such is the method said to be practised at Brunswick, where the best mum in Germany is brewed. The only variation made by English brewers, is the substitution of cardamom, ginger and sassafras, for the inner rind of the fir-tree; and the addition of elecampane, madder, and red sanders.

To those whose palate requires the stimulus of viscid and spicy preparations, *mum* is doubtless a grateful beverage; and a pint of it taken at night, may serve as a sudorific in recent catarrhs and rheumatic attacks. The Germans drink it frequently, in consumptive habits; as an opinion prevails among them, that such liquor contributes to obesity, and increases the muscular energy.

MUMMY, in horticulture, signifies a kind of wax employed by gardners, in grafting and planting the roots of trees. It is prepared as follows: Take one pound of black pitch, and a quarter of a pound of turpentine, mix them in an earthen pot, and set the whole on fire in the open air: the mixture should be alternately quenched and lighted, till all the nitrous and volatile parts be evaporated, when a little common wax is to be incorporated with the composition, which is now fit for use.

MUMPS, or *Cynanche parotidæa*, a contagious disease, that chiefly affects the lower classes, and is often epidemic. It is distinguished by an external moveable swelling, that arises on one side of the neck, but more commonly on both, and frequently attains a considerable size: while the fauces appear red, and the patient has a sensation of straitness. The powers of respiration and of deglutition are somewhat impeded, and the disease is mostly accompanied with a slight degree of inflammatory fever. The tumour increases for three or four days; when it begins to subside, and, in a few days, totally disappears, together with the fever. Next, it is remarkable, that the contents of the scrotum in males, and the breasts of females, become affected with large hard, and often painful swellings, which generally subside in a few days. Sometimes, however, the tumour in the fauces is suddenly suppressed, and not attended with the last mentioned symptom; in which case the fever increases rapidly, is often succeeded by delirium, and has sometimes proved fatal.

The mumps being a disease which commonly terminates without danger, it is scarcely necessary to specify any remedies. The principal requisite is, to keep the head and face warm, to avoid taking cold, and to regulate the bowels by the mildest cooling laxatives. But, should the tumour in the neck suddenly vanish, and the inflammatory fever increase, so as to induce an apprehension that the brain will be affected, it will be advisable to promote and reproduce the swelling by warm fomentations; and, to obviate the fatal consequences that may result from its sudden repression, by means of emetics, venesection, or blisters, according to the nature of the case.

MUNDIC, or MARCASITE, a species of copper pyrites found in the tin-mines of Cornwall, and in other parts of the world. It is of various colours, being sometimes yellow, green, or white; but is easily distinguished by its glittering, and frequently contains a considerable portion of copper.

MURIATES, in chemistry, a genus of salts formed of the muriatic acid with certain bases; the most important of these is the muriate of soda or common salt. It exists abundantly in nature, immense quantities of it being dug out of the earth, which requires only to be reduced to powder. In this state it is called rock salt. It is also one of the constituents of sea-water, which when evaporated yields the salt in chrystals.

MURIATIC ACID, in chemistry, is obtained by decomposing common salt: the soda is obtained pure, and the acid goes off in a state of gas.

MURRAIN, a contagious disease incident to cattle; it is known by the animals hanging down their heads, which are swollen; by short and hot breathing; palpitation of the heart; staggering; an abundant secretion of viscid matter in the eyes; rattling in the throat; and a shining tongue.

The murrain is occasioned by various causes, but principally by a hot, dry season, or a general corruption of the air. It raged about the middle of the last century in various parts of Europe, and carried off great numbers of cattle. The remedy then employed, both for its prevention and cure, consisted in a mixture of equal parts of gunpowder, salt, soot, and brimstone: one spoonful of this composition was given for a dose, and washed down with warm water.

In the 36th vol. of *Annals of Agriculture*, the following recipe is inserted for the *murrain in hogs:* A handful of nettles is to be previously boiled in a gallon of small beer, when half a pound of flour of sulphur, a quarter of a pound of elecampane, three ounces of liquorice, and a quarter of a pound of aniseeds, are to be added in a pulverised state. This preparation should be administered in milk, and the quantity here stated, is said to be sufficient for six doses.

But the most effectual preventive of this destructive contagion is, to keep the cattle cool during the summer, and to allow them a sufficiency of water: all carrion should be speedily buried; and as the feeding of those useful animals in wet places, or on rotten grass or hay, frequently causes this malady, their food ought to consist of dry and sweet fodder.—See also DISTEMPER.

MUSCLE, the ORIENTAL PEARL (*Mytilus margaritiferus*), to which we are indebted for nearly all the *pearls* of commerce, has a flattened and somewhat circular shell, about eight inches in diameter; the part near the hinge bent, or transverse, and imbricated, (or covered like slates on a house) with several coats which are toothed at the edges.

Some of the shells are externally of sea-green colour, others are chesnut, or reddish with white stripes or marks; and others whitish with green marks.

These shells are found both in the American and Indian seas.

The principal pearl fisheries are off the coasts of Hindostan and Ceylon. They usually commence about the month of March, and occupy many boats and a great number of hands. Each boat has generally twenty-one men, of whom one is the captain, who acts as pilot; ten row and assist the divers, and the remainder are divers. The latter go down into the sea alternately by five at a time. To accelerate their descent they have a perforated stone of eighteen or twenty pounds weight, fastened by a cord to their great toe, or to some other part of their body. The depth of water through which they pass is from four to ten fathoms; and they collect the muscles into a bag of net-work which they hang about their necks. When desirous of ascending, they pull a rope as a signal to their companion in the boat to draw them up. They are often known to descend as many as forty or fifty times in a day, and at each plunge to return with more than a hundred shells. The usual time for the divers to remain under water does not much exceed two minutes, though some are able to continue immersed more than five minutes.

When the muscles are taken out of the boats, they are placed in heaps on the shore, where they continue about ten days, till the animals become quite putrid. They are then opened and searched for the pearls. One muscle sometimes contains many pearls, a hundred and upwards large and small; and sometimes a hundred muscles have been opened without yielding a single pearl large enough to be of any value.

The pearls are sorted according to their size, by being passed through large brass seives, or through saucers with round holes in the bottom. After having been sorted they are drilled; and then washed in salt water to prevent any stains which might be left by the drilling. The arranging of them on strings is considered the most difficult task of a pearl merchant, in consequence of the correctness of judgment which is requisite in classing them according to their value.

The value of pearls is estimated by their size, roundness, colour, and brightness. A handsome necklace of pearls, smaller than large peas, is worth from 170*l.* to 300*l.* whilst one of pearls not larger than pepper corns may not be worth more than 20*l.* The king of Persia has a pear-shaped pearl so large and pure as to have been valued at 110,000*l.* sterling. The largest round pearl that has been known belongs to the Great Mogul, and is about two-thirds of an inch in diameter. Pearls from the fishery of Ceylon are considered more valuable in England than those from any other part of the world. The smaller kinds are called *seed* or *dust pearls*, and are of comparatively small value, being sold by the ounce, to be converted into powder.

Nacre or *mother-of-pearl* is the inner part of the shell of the pearl muscle. This is of a brilliant and beautifully white colour, and is usually separated from the external part by aqua-fortis, or the lapidary's mill. Pearl muscle shells are on this account an important article of traffic with China and many parts of India, as well as to the different countries of Europe. They are manufactured into beads, snuff-boxes, buttons, and spoons, fish and counters for card players, and innumerable other articles.

The COMMON OR EDIBLE MUSCLE (*Mytilus edulis,*) is a testaceous animal, with a smooth double or bivalve shell of oblong oval form, pointed, and slightly keel-shaped at the beak, flatted and somewhat curved on one side.

The colour is generally blackish, and the length about three inches.

This species of muscle is found adhering to sub-marine rocks, by certain silky threads which it forms from its own body; and it is common both in the Indian and European seas.

At Rochelle, and some other places, modes are adopted of increasing their excellence, by placing them after they are taken from the sea, in pools or ditches where the sea-water is stagnant, and introduced only at particular periods as it is wanted. Muscles are caught nearly throughout the whole year, though they are considered best in the autumn.

The muscle is not only persecuted by numerous enemies, in its own element, but also subject to certain diseases, which have been conjectured to be the cause of the ill effects consequent on the eating of these shell-fish. There are two disorders of that tendency, which, by Dr. MOEHRING, are termed the *moss* and the *scab*. The former is occasioned by the roots of moss being introduced into the shell, so that the water penetrates, and gradually dissolves the fish. The *scab* is caused by tubercles, that are produced by the dissolution of the shell.

Whatever may be the cause, it is well ascertained, that the eating of muscles has sometimes produced cutaneous eruptions; restlessness and agitation; an insupportable itching throughout the whole body, together with erysipelatous inflammations. These complaints, however, may be easily removed by the liberal use of diluents, purges, and emetics; as they have in no instance proved *mortal*.

The edible muscle, nevertheless, furnishes a rich food, though it be difficult of digestion. Even in a sound and fresh state, it is to some constitutions hurtful; and, if contaminated by disease, it becomes, in some degree, poisonous.—As muscles are most detrimental to health, when eaten *raw*, it will always be advisable to boil them with onions; but they should be previously washed with vinegar, and seasoned with pepper: thus qualified, they cannot be injurious, unless eaten to excess, or too frequently.

MUSCLE, in animal economy, a fleshy, fibrous part, destined to be the instrument or organ of motion.

A muscle is composed of a great number of thin parallel plates, each of which is divided into smaller fleshy threads or fibres, and inclosed in its proper cellular membrane. The muscles are divided into three parts, namely, the *head*, *belly*, and *tail*: the first and third are firmly attached to the bones; whereas the *belly* adheres loosely to other parts, by means of the cellular membrane, which swells, when the muscle acts. Their substance is fleshy in the middle, but tendinous or sinewy in the extremities: the fibres of the former are sensible and irritable, while those of the latter are destitute of all sensation.

All the muscles act, by the inflation of their *bellies*; in consequence of which they are compressed or shortened. Thus, in muscular contraction, the noveable bone only is drawn in the di-ection of the fibres, while the other one, to which the muscle is attached, emains fixed. Hence they operate in ome measure as a lever; the two ends f every muscle being fastened to the ones by means of the tendons; but, if ny fibre or nerve of the muscle be di-ided, or only obstructed by a ligature, he power of contraction instantly eases.

Various denominations have been iven to the muscles, according to the ifferent parts where they are situated; but, as these particulars belong to the province of anatomy, we shall only mention, that their number in the human body amounts to about 450, while some of the lower animals are provided with several thousand.

Lastly, the colour of the muscles, in healthy individuals, is deep red; but, in dropsical, or those persons whose humours are in a vitiated state, it is of a paler hue. In the aged, the muscles contract and become rigid:—to retard this inactive and feeble state, there appears to be no better preventive than the frequent resort to the tepid bath; and the constant wearing of flannel next the skin, with a view to promote an uniform degree of insensible perspiration.

MUSHROOM, or *Agaricus*, L. a genus of plants, comprising numerous species, of which more than 300 are natives of Britain; among these, the following deserve to be specified:

1. The *semi-globatus*, or semi-globular mushroom, the gills or under part of which are fixed, and when quite young, of a whitish colour; the edges soon become entirely grey or mottled; and, when old, acquire a chocolate tinge. The stem is hollow, growing two or three inches high, and about the size of a crow's-quill. This species is found in great abundance on grass-plats, and on pasture, chiefly between the months of July and October; when it ought to be carefully avoided, being one of the poisonous fungi, the inadvertant eating of which has frequently proved fatal.

2. The *muscarius* (musky), or rather fly-killing, reddish mushroom, has a large head, which is nearly flat, being generally either white, reddish, or of a crimson hue, and covered with raised, compact, angular warts, that are sometimes thin, ragged, and flat. Its stem is solid, but the pith, or internal substance, shrivels as it becomes old, leaving irregular cavities: it grows in pastures from three to five inches in height, and is from three quarters to an inch and a half, in diameter. Among fir-trees, its head is sometimes twelve inches broad, and the stem from four to six inches high.—This species is also poisonous; and, if mixed with milk, is said to destroy flies: the expressed juice from this plant, when rubbed on walls and bedsteads, has been employed to expel bugs.—Gesenius, a medical author of great reputation, observes, that the celebrated *nostrum* sold at Frankfort, in Germany, under the name of *Ragolo's Anti-epileptic powders*, is supposed to consist of the reddish mushroom mixed with distilled oil, and pulverised valerian: this remedy is considered, on the continent of Europe, as the only safe and certain specific for the cure of that dreadful malady.

3. The *clypeatus*, or Long-stalked Mushroom, which has a hollow, white, viscid, tender stem, that grows to the height of four inches: and is, in general, not thicker than a crow's quill. It is found in the month of September, in wood-lands and pastures; is highly deleterious; and, if improvidently eaten, causes great swelling, sickness, looseness, and other fatal symptoms.

These are the principal poisonous species; but there are doubtless many others, equally pernicious, though not generally known. On the other hand, the harmless and esculent mushrooms, are chiefly the following:

4. The *campestris*, Champignon, or Common Mushroom, the stem of which is solid and white, usually ¾ of an inch high, and of the thickness of a swallow's quill. Its gills, when first expanded, are of a bright-red colour, which gradually acquires a darker shade till they become of a deep-brown cast. This plant at first represents a small globular figure, not unlike a hazel-nut; in which state it is free from worms, and eatable; as the skin, in which it is enveloped, may then be easily separated from its white, juicy flesh: by this circumstance, it will be readily distinguished from a similar plant, the *agaricus vernus*, which is said to be poisonous. The common mushroom is found in woods, old pastures, and at the side of roads, where it attains to perfection in the month of September.

5. The *orcades v. pratensis*, or Meadow Mushroom (by some also called *champignon*) is very frequent on heaths, and dry pastures, being generally found in circular clusters. The cap is of a pale brown, nearly flat, and from one to three inches in diameter. Its stem is very

tough, solid, and white; grows generally to the height of an inch and a half, and as thick as a crow's quill. This species is also eatable in September: it possesses but little smell, while raw, and is somewhat dry; yet, when broiled or stewed, it imparts a pleasant flavour.

6. The *cantharellus* (*Merulius cantharellus* of WITHERING), or Chantarelle Mushroom, is wholly of a yellow cast, similar to that of the yolk of an egg. Its stem is solid, tapering downwards, being from one to two inches high, and from ¼ to ¾ of an inch in diameter. It is found in woods and dry pastures, from July to September. This plant, when boiled with salt and pepper, possesses the flavour of a roasted cockle: it is esteemed, together with the prevalent species, as a great delicacy.

7. The *deliciosus*, or Orange-coloured Mushroom, grows from one to two inches high: its stem is from ¼ to ¾ of an inch in diameter; and is crowned with a flat cap, from one and a half to three inches broad, and of a rich reddish-brown colour; but its flesh is of a pale orange cast. In its sensible properties, this species is similar to the preceding. It is in season in the month of September, and is found in dry and elevated woods. The Italians, especially at Genoa, preserve it in olive-oil, and esteem it as great a delicacy as the celebrated *boletus* of the Romans. There are, however, two other varieties greatly resembling the orange-coloured eatable mushroom, but which are, in a high degree poisonous; especially the *torminosus* (*piperatus* of WITHERING), which grows on the roots of birch-trees, for instance, at Haughwood near Woolhope, Herefordshire; and the *necator*, which is of a dirty yellowish cast, appears to be composed of woolly fibres filled with a glutinous dew; and thrives in the same place, as well as in the park at Edgbaston, under large Spanish chesnut-trees.

8. The *cinnamomeus*, or Brown Mushroom, has a convex, but flatted, clothy cap; often with a central rise, in colour resembling that of a chesnut, or newly tanned leather. Its long stem is yellowish and naked, and the gills tawny red. This plant is readily distinguished by its cinnamon colour; in the months of September and October, it abounds in woods; it emits an agreeable odour, and, when boiled, possesses a fine flavour.

9. The *violaceus*, or Violet-coloured Mushroom, has numerous purple gills, eight in a set: the cap being of a purple or brown-cast, convex, and the edge turned down; the stem is also purple and cylindrical, from ½ to one inch in diameter, and growing from one to four inches in height. This species remarkably varies, both in its size and tints. When full grown, the cap changes its lilac colour to a russet hue; but the gills continue nearly in the same state: hence, according to Major VALLEY, the latter afford a more accurate *criterion*, with respect to colour, than any *other* part of mushrooms in general. The violet-coloured mushroom is in perfection from October to December. When thoroughly boiled and seasoned, it is asserted to be as palatable as an oyster.

[The *procerus*, which is tall, spongy, with white gills, and a large horizontal ring round the stem, is in perfection about September.—T. C.]

We have now enumerated the principal species of mushrooms that are poisonous as well as those which may be safely eaten; but, as their harmless, or noxious properties, in a great measure depend on the nature and situation of the soil producing them, it will always be necessary to attend to this circumstance, before they are gathered. There is no doubt but that the gills inhale the stagnant or superfluous vapours from the ground; hence they speedily putrefy, and become the prey of worms, flies, and other insects.

In horticulture, the esculent mushrooms only are raised artificially; for this purpose when no young plants can be procured from the fields or gardens, their roots, spawn, or embryons, may be generated from unfermented horse-dung, laid unbroken in small heaps, under cover. In a few weeks, during the summer months, fibrous roots will appear, resembling white threads, which, on separating the heaps, emit the smell of mushrooms.

The dung is directed to be carefully piled up, as entire as possible, about three inches thick, on a hot-bed of a moderate heat; and formed of alternate strata of horse-dung and tanners'-waste; the uppermost layer being composed wholly of tan to the thickness of two inches. The bed is next to be covered with a little manure, and to be raised about three inches, with good soil: when it is finally overspread with a thick stratum, or coat of straw.

The most proper place for the formation of mushroom-beds, is in the shed usually erected behind hot-houses; because, as these plants vegetate without light, warmth only is requisite, provided they be occasionally watered. The French practise a method of rearing these plants, which is both simple and expeditious: they pour the water, that has been employed for washing eatable mushrooms, on the usual hot-beds, and thus a constant succession of growth is obtained, especially if the stalks be left in the ground, when their heads or caps are gathered for the table. In China, the putrefied wood of elms and willows is formed into a bed, and covered with the leaves of these trees; the whole is then frequently watered with a weak solution of nitre. This composition produces continual crops of the most delicious *champignons*, which are collected in the manner before stated.

Mushrooms form an isthmus between the animal and vegetable kingdoms; and it is not yet ascertained, whether they can be propagated by seed. When in a state of putrefaction, they emit a cadaverous smell; and it appears from the experiments of VON HUMBOLDT, that they are equally good conductors of GALVANISM, or of the *Galvanic Fluid*, as real animal matters. He farther observes, that their participation of animal nature is evinced by chemical analysis; because mushrooms contain a remarkable portion of azote and phosphorus; and *morels* may be converted into *fat*, by means of the sulphuric acid, or oil of vitriol, diluted with water.

Considered as an article of food, mushrooms are, when skilfully chosen, wholesome and nourishing. But many species of this numerous genus of vegetables are extremely deleterious, and cannot be accurately distinguished from such as are harmless and esculent: it would not therefore, be attended with any *loss*, excepting to the epicure, if mushrooms were totally banished from our tables. Should any noxious species have been inadvertently eaten, it will be requisite to take a dose of ipecacuanha, or of the antimonial emetics, in order to eject the poison as speedily as possible; or, if the accident be discovered only after some hours have elapsed, copious draughts of vinegar and water, or oil and vinegar, will then form the most efficacious antidotes.

[A treatise on mushrooms has lately been published at Paris, containing plates and ample descriptions for choosing those that are not deleterious. They grow well in the dark.—T. C.]

MUSIC, denotes the art of producing and combining sounds, in such a manner as to render them agreeable to the ear.

Music forms a pleasing recreation, and is calculated to produce the happiest effects upon the mind, or to exhilarate the animal spirits. Hence it has with advantage been employed *medicinally;* instances having occurred, in which patients labouring under delirious fever, were calmed; and a *critical* sleep succeeding, they were eventually cured.

This art may be likewise beneficially practised by persons of low melancholic temperament; as, according to the nature of the tunes played, it is equally calculated to excite pity, to soothe the mind, and to rouse the social affections.

MUSK, *Moschus moschiferus;* a small quadruped somewhat shaped like a deer, but without horns; it has two projecting tusks curved downward, a short tail, and about the middle of the under part of the male there is an oval bag about the size of a small egg.

This animal is seldom more than about two feet in height at the shoulder, and is clad with long, upright, and thickset hair. Each hair is waved, and of three different colours; the tip ferruginous, the middle black, and the bottom dusky.

It inhabits the mountains of Thibet, Tonquin, and Siberia.

The drug called *musk* is a brown fatty substance appearing somewhat like clotted blood, which is contained in the bag or receptacle under the belly. This bag has two small external orifices, through which, when it is overcharged, the animal squeezes it out upon trees or stones. The mode in which musk is collected for sale is to kill the animals, cut off the bags, and tie them closely up to prevent it from being spoiled by evaporation. In those countries where the animals are most abundant they are pursued in the autumn and winter, with generally so much success that many thousands of bags are annually collected. It is, however, presumed that of those which are sold many are factitious, formed of other parts of the skin, and filled with musk adulterated by mixture with other substances. Indeed so valuable is this drug that it is seldom to be obtained in a pure state. To increase its quantity blood is not unfrequently mixed with it; and to increase its weight lead finely ground, and sometimes even little bits of lead, are put into each of the bags. The natives of India are said to have various methods of detecting this adulteration by the taste and weight; but principally by a thread steeped in the juice of garlic, which they draw through the bag with a needle, and which if it retain the smell of garlic is considered a decisive indication of the musk having improper ingredients mixed with it. The purest musk is said to be that which is brought from Patna, in the dominions of the Great Mogul, where it is collected from various parts of the interior of the country. It is imported into Europe in bags, each of which is about the size of a pigeon's egg, well filled, and covered with short brown hair.

Musk was formerly much used as a perfume. It is now chiefly in repute as a medicine in spasmodic, convulsive, and other complaints; and when properly given is thought a remedy of great service. So powerful is the scent of this drug that the smallest particle of it will perfume a very considerable space; and when the bags are fresh, if one of them be opened in a close apartment, every person present is obliged to cover his mouth and nose with several folds of linen to prevent suffocation.

In all the countries where these animals are found, their *skins* are in great request as a strong and valuable leather; and when tanned and properly prepared, the Russians have a method of rendering it nearly as soft and shining as silk; in this state it is used by them as a summer dress. These skins are also sometimes dressed as *furs* for winter clothing. The *flesh* of the musk is frequently eaten; but that of the young ones only is tender and of good flavour.

These animals, which are astonishingly light and active in all their motions, and at the same time of inoffensive and timid habits and disposition, are caught by snares placed near their feeding places, shot with arrows, and sometimes killed by cross-bows, so placed that they discharge arrows by the animals' treading on a string connected with the trigger.

MUSQUITOE. A well known and troublesome insect in all warm climates. An experiment lately made in Wilmington, Delaware, would seem to shew, that a small quantity of spirits of turpentine, thrown into a water hogshead, commonly kept in yards, will effectually prevent their propagation. Another portion may be added in a few days afterwards, if necessary. Water hogsheads are fruitful sources of these insects. From eight to ten thousand of them, it is said, may be seen in a single hogshead. They take wing in about 48 hours after the egg is deposited, and give place to as many more. The period of their breeding is about ten weeks, and allowing a water hogshead to every house in a city, what myriads of these insects must be generated!

MUSTARD, or *Sinapis*, L. a genus of plants, comprising nineteen species: three of which are natives of Britain: namely,

1. The *arvensis*. See Charlock.

2. The *alba*, or White Mustard, which grows in corn-fields, and on road-sides; it flowers in the month of August. This species, when cultivated, thrives best in a soil that is naturally heavy, but which has been reduced to a fine mould, by tillage: it is propagated by sowing one bushel of the seed per acre, in the month of March; it should be frequently hoed; and, when the plants arrive at a proper size for transplantation, they may be set out, ten inches apart. Mustard may be sown on the same land, for three successive years; and it always leaves the soil in sufficient tilth for the reception of any other crop. Its leaves afford a grateful food to sheep, and other cattle: the seed yields from every cwt. 33 or 36 lb. of a sweet, mild oil. Bees are remarkably attached to the flowers. This plant is likewise raised by gardeners in the winter and early in the spring, with a view to supply the table with salad.

3. The *nigra*, or Common Mustard, growing in corn-fields, on ditch-banks, and on road-sides; flowering in the month of June. The sauce called *mustard*, and in daily use at our tables, is prepared from the seeds of this species, obtained by culture, and reduced to powder. They likewise afford a considerable quantity of expressed oil, which partakes but little of the acrimony of the plant. When unbruised, they impart a very weak flavour to boiling water; but, in a pulverised state, they coagulate milk, and strongly impregnate both fluids. If a watery infusion be taken in a considerable quantity, it operates as an emetic; but, in the proportion of a table-spoonful or two, it is a gentle laxative; in this form, it has proved of service in cases of asthma, chronic rheumatism, and palsy. Cataplasms, prepared with crumb of bread, vinegar, and pulverised mustard-seed, are excellent stimulants, when applied to benumbed or paralytic limbs; to parts affected with fixed rheumatic

pains, and to the soles of the feet, in fevers that require such treatment. In short, mustard acts powerfully upon the nervous system, without exciting a high degree of heat: by its acrimony and pungency, it stimulates the solids, so that it is deservedly recommended for exciting appetite, assisting digestion, and promoting the fluid secretions, being greatly preferable to the generality of acrid plants of the *anti-scorbutic* class.

In 1798, a patent was granted to Mr. ROBERT JOHNSTON, for his contrivance of a medicine which he calls *Improved Essence of Mustard.* The particulars of this patent are inserted in the 9th vol. of the *Repertory of Arts, &c.*

MUSTARD, the HEDGE, or *Erysinum*, L. a genus of plants, comprising en species, four of which are natives of Britain.

1. The *officinale*, COMMON HEDGE-MUSTARD; WORM-SEED; BANK-CRESSES; or SCRAMBLING-ROCKET: it grows under walls and hedges, on road-sides, and among rubbish; where it flowers in the months of May and June. This species possesses a warm and acrid flavour; and, when cultivated, is used as an early pot-herb. Its seeds, taken internally, promote expectoration, the discharge of urine, and other fluid secretions. The juice has been employed with unparalleled success in ulcers of he throat, and for removing hoarseness, occasioned by loud speaking. Sheep and goats relish this species; but cows, horses, and swine refuse it.

2. The *barbarea*, WINTER-CRESSES; WINTER-ROCKET: or ROCKET-WORMSEED; which grows on walls, in watery places, on banks of running streams, and is sometimes found in cultivated fields: t flowers from May to October. In Sweden, the common people use the eaves of this herb in early salads in the spring, and late in the autumn: they also boil them as kale. It is sown n Britain to obtain spring-salad, and eaten under the name of *French Cress.* Cows devour this plant; but horses and swine refuse it; and it is disliked by goats and sheep.

3. The *alliari*, GARLIC HEDGE-MUSTARD, JACK-BY-THE HEDGE, SAUCE-ALONE, or GARLIC WORMSEED, thriving on ditch-banks, in hedges and shady places; it flowers in the month of May. When growing in farm-yards, poultry are induced to eat this herb, which imparts o their flesh an intolerably rank taste. The Prussians eat the leaves, in the spring, with salted meat; and they are equally useful with lettuce, and the colder salads. In Wales, it is frequently used as a frying herb. The seeds excite sneezing. BAUTSCH employed this herb with advantage in the process of tanning. Cows and goats eat the plant; but horses, sheep, and swine refuse it.

4. The *cheiranthoides*, TREACLE-HEDGE-MUSTARD, or TREACLE-WORMSEED, thrives in corn-fields, and on the banks of rivers; it flowers in the month of July. The seeds of this species are, according to Dr. WITHERING, successfully used by the country-people, for destroying worms. The plant is eaten by horses, cows, goats, sheep, and swine.

MUTTON, denotes the flesh of sheep, after they have been deprived of life.

The best and most nutritive *mutton*, is that of sheep which are at least three, but not more than six years old; and which have been reared on dry, sweet pastures. The meat afforded by such as have been fed on salt-marshes, or near the sea-coast, is likewise sweet and wholesome.

The flesh of ewes, and especially of wethers that have not been kept above the age before stated, is of a rich and invigorating nature; while that of rams is not only tough and coarse, but also has a strong, unpleasant taste. Young meat abounds with sweet juices, and is easy of digestion; though, if under three years of age, it seldom attains its peculiar relish, and is generally somewhat *ropy*.

If a piece of mutton be designed for roasting, it will be advisable to expose it to the open air for several days, according to the state of the weather or season. Thus, it will afford a savoury dish, which is easily digested, and agrees with every healthy person.

MYRRH, a gummy-resinous, concrete juice, obtained from a shrub growing in the East-Indies, but of which we possess no certain account.

The best myrrh is somewhat transparent, of an uniform brownish, or reddish-yellow colour; of a slightly pungent, bitter taste; with a strongly aromatic, not disagreeable odour, though nauseous to the palate.

In its medicinal effects, this aromatic bitter, when taken by the mouth, is supposed to warm and strengthen the stomach and other viscera; it frequently occasions a mild diaphoresis, and, in general, promotes the fluid secretions. Hence it has been used with advantage, in cases of debility; in diseases arising from suppression of the urine, or from immoderate discharges, in *cachetic* habits, and those persons whose lungs and throat are oppressed by viscid phlegm. It is farther believed to resist putrefaction in all parts of the body; on which account it is highly recommended in malignant, putrid, and pestilential fevers; and in the small-pox. For these purposes, it should be taken in doses of half a drachm or upwards; and it may also be usefully combined with nitre, cream of tartar, or some other cooling salt. Being, however, a heating and stimulating medicine; its *proper* choice requires some precaution, and ought to be directed by professional advice.

MYRICA, *Candle-berry Myrtle;* a genus of plants comprehending the following native species: 1. *M. Cerifera.* This grows upon low boggy lands in the southern states, rising with many strong shrubby stalks to the height of six or eight feet; the leaves are stiff and spear-shaped, of a yellowish lucid green on their upper surface, but paler underneath; of a grateful odour when bruised. The catkins come out on different plants from the berries, and are about an inch long, and erect. The female flowers come out on the sides of the branches in long bunches, and are succeeded by small roundish berries, covered with a mealy substance, and afford a green wax by boiling.

2. *M. Cerifera humilis,* dwarf candleberry myrtle; a variety of the former: bark grey, leaves shorter and broader, and more serrated.

3. *M. Gale,* bog gale; also grows in swamps, to the height of two or three feet; leaves lance-shaped, smooth, and a little sawed towards the points. The berries are dry, compressed at the apex, and three lobed. This species grows in New Jersey, but abounds in the eastern states, and in Nova Scotia, according to Mr. Bartram.

The wax is obtained in South Carolina and Georgia, by boiling the berries of the *M. cerifera* in water, and skimming it. Mixed with tallow, it forms excellent candles; a soap may be also made from it. The following recipe for the purpose, by Judge Bee, is inserted in a little pamphlet, published in the year 1788, by the *Agri. Soc. of Charleston, S. Carolina:* "To three bushels and a half of common wood ashes, was added half a bushel of unslacked lime; these, being well mixed, were put into a sixty gallon cask, which was filled with water. In 48 hours, the ley was strong enough to bear an egg: it was then drawn off, and from six to eight gallons of it put into a copper kettle, capable of containing about twenty-five gallons; four pounds of myrtle wax were added, and the kettle kept boiling over a constant steady fire, from nine o'clock in the morning, till three in the afternoon. For the first three or four hours, a supply of strong ley was added, from time to time, until the liquor appeared like soft soap; then weaker ley was poured in occasionally, and the whole frequently well stirred. After six hours boiling, two quarts of common coarse salt were thrown into the kettle, which was left one hour more to simmer over a slow fire. The liquor was then put into two large tubs to cool, where it continued twenty-four hours; and then the soap was taken out, wiped clean, and put to dry. The next day it was weighed, and the produce was 49 lbs. 2 oz. of solid soap." The loss of weight by drying is not mentioned: but Mr. Bee "was informed by one who made the trial, that at the end of six weeks, it was very trifling."

From Dr. Bostock's experiments on myrtle wax, (Nicholson's *Jour.* vol. 4.) it appears, that "when boiled with liquid caustic pot-ash, the fluid becomes turbid: but, after some time, the greatest part of the wax rises to the surface, nearly without colour, in a floculent form. A small quantity of it only remains dissolved in the pot-ash, and this may be precipitated from it by an acid. That part of the wax which rises to the surface, is converted into a saponaceous matter: it has lost its inflammability and fusibility, and forms an opaque solution with water. From this solution, it is precipitated by an acid in the form of white flakes, which, when collected resemble very nearly the wax before its union with the pot-ash."

In the Medical Repository, of New York, it is stated, that Dr. Joseph Browne, of that city, had discovered a cheap and easy process for bleaching myrtle wax, but it has not yet been published. No doubt, however, the colouring matter may be destroyed by the process for bleaching common bees wax, described in vol. I. article Bee; or by the vapour of alkalis, which, according to Chaptal, destroys the green colour of all vegetable matter.

MYRTLE, or *Myrtus,* L. a genus of exotic trees, comprising forty-two species; of which the *communis,* or common myrtle-tree, only is cultivated in Britain. There are several varieties, known under the names of broad-leaved, Roman, Dutch, and Jew's myrtle; orange-leaved Spanish myrtle; the thyme-leaved, rosemary-leaved, box-leaved, and upright Italian myrtles, &c.

All these varieties are beautiful evergreens; which, though requiring the shelter of a green-house in the more northern parts of Britain, during the winter, vegetate most luxuriantly in the county of Cornwall, and on the southern coast, in the open air, without being sheltered from the severity of the winter.

The common myrtle is easily propagated by cuttings, which may be set in beds of a rich, but light soil, beneath glasses, or in a green-house, where they thrive with uncommon rapidity.—In the Island of Minorca, the young tops are employed for tanning; and the berries are eaten by the inhabitants.

In Britain, however, this species is cultivated chiefly for ornament; though it is likewise of service as a medicine. A distilled water is obtained from its leaves; which, being both detersive and astringent, is sometimes used in gargles, or as a cosmetic for fixing the teeth, when loosened by the scurvy. Its berries are distilled; and the oil they yield, is reputed to be excellent for thickening the hair; on which account it is frequently used as an ingredient in pomatums, and other cosmetics. Lastly, a decoction of the flowers and leaves is said to be of great service in fomentations.

Myrtle the Dutch. See Gale the sweet.

N.

N, the fourteenth letter in the alphabet, and the eleventh consonant: it is a liquid, the sound of which is formed by forcing the voice strongly through the mouth and nostrils, being, at the same time, intercepted by applying the tip of the tongue to the fore part of the palate with the lips open. It suffers no consonant immediately after it in the beginning of words and syllables, nor any before it except *g*, *k*, and *s*, as in *gnaw*, *know*, *snow*. As a numeral, N stands for 900, and with a dash over it $\bar{N}$ for 900,000. N. or No. stands for *numero*, i. e. in number; and N. B. for *nota bene*, observe well.

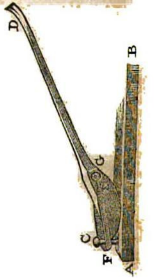
NAILS, in anatomy, are horny laminæ or plates growing over the ends of the fingers and toes of men, as likewise over the lower extremities of the inferior animals.

The use of the nails in animal economy, is to defend and cover the nervous warts or papillæ of the toes and fingers from external injury, when they come in contact with rugged bodies. They should not be suffered to grow to a considerable length, as the impurities collecting beneath them not only present a slovenly picture, but such neglect also renders the nails liable to be split and broken by various accidents.

NAILS, in building, are small pointed spikes, generally with a flat, or convex head, made of brass, iron, or other metal; which, when driven into wood, serves to connect several pieces, such as boards and laths, or to fasten a piece of timber, &c.

Nails are divided into numerous classes: their figure and size vary according to the purpose for which they are designed; and which it would be superfluous to enumerate. As they are of such essential importance in building, the arts, and economy in general, several privileges have been granted for new inventions, or improvements, in the manner of casting, or manufacturing them. On account of their ingenuity, the following patents deserve to be mentioned; namely, Mr. Finch's, obtained in 1790; Mr. Clifford's, registered in the same year; and Mr. Spencer's, granted in 1801. But, as these processes can only be understood and practised by manufacturers, we cannot enter into any detail, but refer the curious reader to the 7th, 9th, and 15th vols. of the *Repertory of Arts*, &c. where full specifications are inserted; and Mr. Spencer's patent is illustrated with an engraving.

NAIL, and BOLT-DRAWER. In the year 1787, the *Society for the Encouragement of Arts*, &c. conferred a bounty of three guineas on Mr. William Rich, of Yalding, Kent, for his invention of a machine, which is represented in the following cut, in the action of drawing out a spike.



A. B. the piece of timber, in which the nail or spike C, intended to be drawn, is inserted.

D, E, the shape of the tool, consisting of a lever D, that moves on a solid basis, in the form of a segment of a circle, as at E.

F, a square staple, turning on a centre at G: and, if the spike to be drawn, be held between the lever and the staple, any pressure at D, will act with an effect proportionate to the distance *a* F, and D *a*; and the workman will thus be enabled to exert a very great force against the spike C.

Mr. Rich's nail drawer is both simple and ingenious; it is eminently serviceable in breaking up ships, and on other occasions, where large nails and spikes have been driven deeply into wood, from which they are to be extracted.

Nail-wort. See Whitlow-grass the common.

NAPHTHA, in chemistry, one of the bitumens which has been much used in the experiments on the newly discovered metals Potassium and Sodaium. It may be procured by carefully distilling petroleum, and then rectifying it.

NARCOTICS, a term comprehending opiates, anodynes, or paregorics, and all other drugs which induce sleep or occasion stupefaction.

The narcotics chiefly employed in medicine are, opium, henbane, hemlock, &c. respecting which the reader will, in the order of the alphabet, find a concise account of the cases in which they may be used with advantage.

Whatever tends to induce stupor ought to be carefully avoided, or at least very cautiously administered in disorders of the stomach and intestines; for no other class of drugs is productive of such pernicious consequences to the nervous system. If taken in very small doses, narcotics at first excite and increase the action of the nerves, while they produce gentle undulations of the circulating blood; but, in a larger proportion, they stimulate, and at length reduce or debilitate, all the nervous and muscular functions. Thus, their consequent effect is similar to that of *wine*, which, if used in moderation, promotes a temporary activity, by invigorating the nervous power, or rather by causing an additional motion (which in physic is called *congestion*) of the fluids towards the head; but, when drank too freely, it weakens and stupifies all the sensitive organs, by the usual pressure it causes on the brain. Hence it will be readily inferred, that such *heroic* remedies can be prescribed with safety, by those only who are acquainted with the animal economy.

NATRON, in chemistry, a term frequently given to soda, upon the supposition that it is the natron or nitrum of he ancients. Natural natron occurs either as an efflorescence on the surface of the soil, or on decomposing rocks of particular kinds, or on the sides and bottoms of lakes that become dry during the summer. In Hungary the natron lakes are very numerous, and afford a vast quantity of it annually. About sixty miles north-east of Grand Cairo in Egypt, there is a lime stone valley, in which there are several extensive lakes, which become dry during the summer, and leave their sides and bottoms covered with a great quantity of soda or natron.

NATURAL HISTORY, the description of the productions of nature.— The natural history of a place is a topic of wide and various range. Mr. Boyle suggests, that it may be conveniently reduced to four heads: I. The things that regard the heavens: II. The air: III. The waters: and IV. the earth.

I. Of the first class are, 1. The longitudes and latitudes of places; 2. The length of the longest and shortest days and nights; 3. The climates and parallels; 4. The fixed stars seen there or otherwise.

II. Of the air should be observed, 1. Its temperature; 2. Its weight; 3. Its variations, the meteors most usual in it; 4. The winds most general; 5. The diseases said to depend upon its state; or in which it may be supposed to have a share; 6. Its usual salubrity; and 7. The sort of constitutions it does and does not agree with.

III. Of the waters, 1. The sea—its depth, tides, currents, saltness, and other qualities and peculiarities; 2. Rivers; 3. Lakes; 4. Mineral waters; 5. Fish and other productions.

IV. The things relating to the earth are last to be examined: these are, 1. The earth itself; II. Its inhabitants; III. Its productions. In the earth itself, 1. its dimensions; 2. its situation; 3. its figure; 4. its surface, whether flat or otherwise; 5. the height, and other particulars of its mountains; 6. the soil; 7. its artificial improvements, if any. II. The inhabitants are then to be considered—1. their persons; 2. their diet, inclinations, and customs; 3. their constitutions; 4. their diseases. III. With respect to the external productions of the earth, 1. vegetables; 2. animals: 3 minerals, &c.

Natural history, in a more appropriate sense, treats of those substances of which the earth is composed, and of those organised bodies, whether vegetable or animal, which adorn its surface, soar into the air, or dwell in the bosom of the waters. In this restricted sense, natural history may be divided into two heads; the first teaches us the characteristics, or distinctive marks of each individual substance, whether animal, vegetable, or mineral; the second renders us acquainted with all its peculiarities, in respect to its habits, its qualities, and its uses. To facilitate the attainment of the first, it is necessary to adopt some system of classification, in which the individuals, that correspond in particular points, may be arranged together. A knowledge of the second head can only be acquired by a diligent and accurate investigation of each particular object.

The study of natural history consists in the collection, arrangement and exhibition of the various productions of the earth. These are divided into three great kingdoms of nature, the boundaries of which meet in the ZOOPHYTES, which see. Minerals occupy the interior parts of the earth, in rude and shapeless masses. They are concrete bodies, destitute of life and sensation. See MINERAL KINGDOM. Vegetables clothe is surface with verdure, imbibe nourishment through their roots, respire by means of leaves, and continue their kind by the dispersion of their seed. They are organised bodies, possessing life, but they are probably destitute of sensation. See BOTANY. Animals inhabit the exterior parts of the earth, respire, and generate eggs: are impelled to action by hunger, affection and pain; and by preying on other animals, and vegetables, restrain within proper limits and proportions the numbers of both. They possess organised bodies, enjoy life and sensation, and have the power of loco-motion.

The LINNÆAN system is divided into classes, orders, genera, species and varieties, to each of which their names, and characters are affixed. In this arrangement the classes and orders are arbitrary, the genera and species are natural. Of the three grand divisions of nature the animal kingdom stands highest in the scale, next to it the vegetable, and lastly the mineral kingdom. To the vegetable and mineral kingdoms we have already referred; with regard to the animal kingdom we may observe, that animals enjoy sensation by means of a living organisation; animation by a medullary substance; perception by nerves, and motion by the exertion of the will. They are furnished with members for the different purposes of life, organs for the different senses and faculties, or powers for the application of their different perceptions. The following is an abstract of the LINNÆAN arrangement of the animal kingdom.

CLASS I. *Mammalia.*

Orders.—Primates, Bruta, Feræ, Glires, Pecora, Belluæ, Cete.

CLASS II. *Aves.*

Orders.—Accipetres, Picæ, Anseres, Grallæ, Gallinæ, Passeres.

CLASS III. *Amphibia.*

Orders.—Reptilia, Serpentes.

CLASS IV. *Pisces.*

Orders —Apodes, Jugulares, Thoracici, Abdominales, Branchiostegi, Chondropterygii.

CLASS V. *Insecta.*

Orders.—Coleoptera, Hemiptera, Lepidoptera, Neuroptera, Hymenoptera, Diptera, Aptera.

CLASS VI. *Vermes.*

Orders.—Intestina, Mollusca, Testacea, Zoophyta, Infusoria.

NATURE, this word has various significations, as it is now used. It denotes,

1. "The universe, or whole body of created things;" in which sense we say, the author of Nature; the God of nature; nature is beautiful; there is no such thing in nature as a phœnix.

2. "The properties or qualities of things; in which sense we say, such a man is noble by nature (meaning that his nobleness is an inherent quality;) the nature of fluids; by nature a stone falls to the earth; the established order of things (meaning that order which results from the properties or qualities of things;) nature (in a living body) is strong or weak (meaning that the natural properties or qualities are exhausted or in vigour;) nature left to herself will perform the cure (meaning that the natural properties or qualities will perform it;) good nature
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3. "The creative and superintending intelligence;" in which sense, we say nature, when we mean God; nature is benevolent and wise. Here by nature, we understand either the Deity himself or a power performing the will of the Deity, and conducting every thing in this world under his order; a notion supported by some ancient systems of philosophy, adopted by poets, and most easy to popular idea. Independently of this, however, we often say Nature herself, &c. in a merely figurative sense; personifying the laws of nature, that is, the properties of matter. When, therefore we say, that nature covers the earth with abundance, we mean that God covers the earth with abundance; when we say that nature is magnificent and inexhaustible, we mean that creation is magnificent and inexhaustible; when we say that it is the nature of sugar to be sweet, we mean that sweetness is a quality or property of sugar. When we speak of the study of nature, we mean the study of creation; which embraces first, the knowledge of things, and secondly, the knowledge of the properties of things.

When we speak of nature as opposed to what is artificial, we mean, according to the occasion, the original state of creation, or the original qualities of things; thus we say, the state of nature, alluding either to mountains, forests, &c. or to man; and a natural soil, in opposition to one that has been cultivated.

Nature, the whole body of created things, presents an assemblage of objects in every respect worthy of the attention of mankind. As an animal whom it behoves to make provision for his wants, the knowledge of its productions, and the means by which they may be best obtained, is of indisputable importance; these are points of view in which no persuasive to the study is necessary: necessity, and the rich rewards of assiduity, have ever stimulated him; and the shepherd and the husbandman have always been attentive to its phenomena: but the intellectual powers of man require other sources of enjoyment, and these, too, nature can supply. Here, curiosity can never want a motive; here, all the pleasures of tender feelings or sublime conceptions may be enjoyed. Assuredly the Deity designed that man should thus employ himself. Nature is made to conform in some degree to the hand of man, and resist only when his ignorance violates its essential order; it yields its secrets to his enquiries. To his sensibility it presents the most engaging images; and remains, to all ages, a picture perpetually renewed of the primitive creation of God. Were the whole human race depraved, and nothing but falsehood left in its society; on nature, the true character of the Deity would still remain impressed: there the innocent might still find enjoyment, the unhappy, consolation, and the despairing, hope. Its placid scenes calm the feelings, its grand ones exalt them; and neither of these states of mind are compatible with crime. Assuredly, nature proves not only that the motives for wickedness are absent from its haunts, but also by its salutary influence on the nerves, is designed to have a beneficial effect on the moral character of man. Another great consideration, in behalf of the study of nature (and this more peculiarly belongs to the study of the qualities of things) is the relief it affords from superstition.

NAVIGATION, the art of conducting a ship from one place to another. It implies not only the mechanical management of the sails, and working the ship, which must be learned on shipboard, and in the practice of sailing, but likewise the theory, which is be obtained from the following sources:

1. A table of the latitudes and longitudes of the most parts of the sea-coast, rocks, shoals, &c. in the frequented part of the world.

2. Maps and charts of the seas and lands, together with the depths of water, and the tides and the nature of the coast one may have occasion to approach.

3. The use and application of several instruments, necessary to point out the way the ship has to steer, to measure the rate she runs at, and to find the place she is in whenever necessary.

4. A sufficient stock of mathematical learning, particularly *trigonometry*, to enable a mariner to make a right use of the observations that may be deduced from the preceding elements.

NAUSEA, or Sickness, denotes a propensity and exertion to vomit, which may be induced by various causes, such as apoplexy, fevers, violent pain, crude aliment, indigestion, diseases of the liver, &c. but especially by any local irritation of the digestive organs.

This affection, though disagreeable, is often very serviceable, by relieving the stomach when overloaded with incongruous matter, and by promoting expectoration in cases where the lungs are oppressed with mucus or phlegm. Farther, it often induces sensible perspiration, and contributes to the proper distribution of the fluids throughout the body: hence, nausea has proved to be an excellent remedy in various complaints, where it was artificially excited, by the smallest doses of emetics. In some cases, however, it is injurious to the patient, especially when too violent, or too frequently repeated; as it is apt to debilitate the stomach; so that, in consequence of the necessary exertions, the patient becomes exhausted, and is apt to be afflicted with ruptures or other maladies.

Pregnant women are particularly subject to nausea, and vomiting, which, if they be not timely mitigated, are productive of the most serious consequences: for this the usual remedy is, tea made of cloves with a little ginger; about a tea-cupful taken occasionally when the symptoms are urgent. With a view to afford some relief in those distressing situations, Dr. MARCARD recommends the use of *acidulated mineral waters*, especially those of Sedlitz. The water of pure ammonia, or caustic vegetable alkali, has lately been prescribed with success by Dr. JOHN SIMS, who has often found it eminently useful in cases where acidity prevails, such as heart-burn, cough upon taking food, and other complaints of pregnancy. This judicious practitioner directed twenty drops of the pure ammonia to be taken in a glass of water, from which the patient experienced immediate relief.

NAUTILUS, in natural history, a simple shell, having no hinge, formed of one continued piece, rolled as it were, into a spiral form, and having its cavity divided into a great number of cells, by transverse partitions, each of which has a perforation, and is continuous to the others by means of a pipe carried the whole length of the shell. The animal is famous for using its shell in the manner of a boat, and thus swimming on the surface of the sea; from which circumstance, it is introduced into the *Essay on Man* in these lines:

Who taught the little *nautilus* to sail,
Spread the thin oar, and catch the rising gale?

NEALING. See ANNEALING.

NEBULÆ, in astronomy, are certain spots in the heavens; some of which, by the discoveries of Dr. HERSCHEL, are found to consist of clusters of telescopic stars, and others appear as mere luminous spots of different forms. The most considerable is one in the midway between the two stars on the blade of Orion's sword, discovered in the year 1656 by HUYGENS; it contains only 7 stars, and the other part is a bright spot upon a dark ground, and appears like an opening into brighter regions beyond. Dr. HERSCHEL has discovered likewise other phenomena in the heavens which he calls *nebulous* stars; that is, stars surrounded apparently with a faint luminous atmosphere of large extent. These the Doctor, by his large telescopes, has proved to be either mere clusters of stars, of such nebulous appearances as might be occasioned by a multitude of stars at a vast distance.

NECK, in animal economy, that part of the body which is placed between the head and the thorax, or chest.

As the description of the different veins, vertebræ, &c. that compose this part of the human frame, is the province of anatomy, we shall here give a few hints relative to those diseases or injuries, to which the neck is peculiarly liable.

1. The *wry neck*. This deformity arises from various causes; being sometimes born with persons, though more generally induced by a preternatural contraction of one side of the neck; a relaxation of one part, while the other retains its usual power, &c.

If the distortion be natural, there is little probability of obtaining relief by art; but, if it arise from contraction of the skin, occasioned by burns, the repeated use of oils, ointments, and emollient fomentations, will relax the rigidity of the fibres. In some instances it will be advisable to restore the natural posture of the head by means of a steel collar or other contrivance in which the neck may be supported, till it resume its proper position. Should these exertions, however, fail to prove useful, surgical assistance must not be neglected; as delay may be attended with danger.

2. *Tumours*. See WENS.

3. *Luxations* of the neck are in general fatal; though, if a partial dislocation take place, it may by proper attention be restored to its natural position. As, however, the treatment in this case is wholly chirurgical, we shall not enter into detail. Let it be obser

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speaking, and not to indulge in any passions; for the consequences of either may prove fatal.

NECTARINE, a smooth-skinned variety of the common peach-tree, from which it differs only in having a smoother rind, and firmer pulp.

There are several varieties of this fruit, known under the different names of Scarlet, Newington, Roman nectarines, &c.; but, as their properties and culture are similar to those of the Peach, we propose to give a concise account of them under that article.

NEEDLE, the Common Shepherd's, Venus-comb, Crake-needle, or Needle-Chervil, *Scandix pecten*, L. an indigenous plant growing in corn-fields, and flowering in the months of June and July. This weed frequently infests corn-fields, and may be eaten as greens, being a wholesome vegetable. When bruised with marsh-mallows, these two herbs are said to afford an excellent application to fresh wounds, especially with a view to promote the extraction of splinters.

NEEDLE, a little instrument made of steel, pointed at one end, and pierced at the other, used in sewing, &c. Needles make a very considerable article in commerce, though there is scarcely any article cheaper, the consumption of them being immense. In the manufacture of needles, the first operation is to pass the steel through a coal fire, and under the hammer, to bring it out of its square figure into a cylindrical one. This done, it is repeatedly drawn through wire-drawing irons, till it is reduced to a fine wire. It is then cut into pieces of the length of the intended needles. These pieces are flattened at one end, in order to form the head and eye: they are then put into the fire to soften them farther, and thence taken out and pierced at each extreme of the flat part, on the anvil, by force of a puncheon of well tempered steel, and laid on a leaden block to bring out, with another puncheon, the little piece of steel remaining in the eye. The corners are then filed off the square of the heads, and a little cavity filed on each side of the head: this done, the point is formed with a file, and the whole filed over: they are then laid to heat red hot on a long, flat, narrow iron; crooked at one end, in a charcoal fire, and when taken out of this, are thrown into a basin of cold water to harden. On this operation, much depends: too great heat burns them, and too little leaves them soft: the medium is learned by experience. When thus hardened, they are laid in an iron shovel on a fire, more or less brisk in proportion to the substance of the needles; taking care to remove them from time to time. This serves to temper them, and take off their brittleness. They are then straightened one after another with the hammer, the coldness of the water used in hardening having twisted the greatest part of them. The next process is the polishing. To perform this, ten or twelve thousand needles are ranged in little heaps against each other on a piece of new buckram, sprinkled with emery-dust. The needles thus disposed, emery-dust is thrown over them, which is again sprinkled with oil of olives; and lastly, the whole is made up into a roll, well bound at both ends. This roll is then laid on a polishing table, and over it a thick plank laden with stones, which two men work backward and forward a day and a half, or two days, successively: the roll is continually agitated by the weight and motion of the plank over it, and the needles within-side being rubbed against each other with oil and emery are insensibly polished. After polishing, the dirt is washed from them with hot water and soap. They are then dried in hot bran, a little moistened, placed with the needles in a round box, suspended in the air by a cord, which is kept stirring till the bran and needles are dry. The needles, thus wiped in two or three different brans, are next put into wooden vessels, to have the good separated from those whose points, or eyes, have been broken either in polishing or wiping: the points are then turned all one way, and smoothed with an emery-stone, turned with a wheel. This operation finishes them, and there remains nothing but to make them into packets of two hundred and fifty each.

Needle, *magnetical*, in navigation, a needle touched with a magnet, or loadstone, and sustained on a pivot in the centre of the compass, where it assists the mariner by its general direction from pole to pole, or, as it is said in Europe, its pointing to the north. See Magnetism.

NEGUS, a well-known compound beverage, prepared of one part of Port-wine, and two parts of water, to which is usually added a small quantity of sugar, lemon peel, &c.

This liquor is pleasant, especially if the juice of a Seville-orange be substituted for that of lemons. As the peel of the last mentioned fruit, however, contains a considerable quantity of highly inflammable and volatile oil, negus becomes more stimulating than pure wine, if it be used in large quantities; but if moderately taken, it may contribute to strengthen the stomach. It should, however, be remembered that asthmatic patients, or those who are subject to diseases of the breast, ought carefully to abstain from this and similar drink; an indulgence in which, may be productive of the worst consequences; as the heating oil, together with the fumes of wine, is too powerful a stimulus to their organs of breathing. All acid liquors are *bad* for persons liable to gout, gravel, or indigestion.

NEREIS, in zoology, a genus of aquatic animals of which the *noctiluca*, or noctilucous (*night-shining*) nereis, a minute insect, is thus described by GMELIN: the head is roundish and flat; the two horns or feelers short and fibulated; the eyes prominent, and placed on each side of the head; the body composed of about twenty-three divisions or joints, smaller nearer the head than at the tail; and the whole animal, which is transparent, and of a water-green colour, is scarcely two lines in length. Each division, which goes round the whole body, ends in a short conical apex, out of which proceeds a little bundle of hairs; and from under these the feet grow in the form of flexile fibulated figments, destitute of any thing like claws. These are microscopic particulars; for the insect, as will be supposed from its minuteness, eludes the examination of the naked eye. This creature inhabits almost every sea, and is one of the causes of the luminousness of the ocean. It shines like a glow-worm, but with a brighter splendour, and is seen upon the surface of the water in such numbers, as, at night, to make the element appear on fire all around.

NERVE, in anatomy, denotes certain white, round, delicate, substances, similar to cords, which proceed from the brain or spinal marrow, and are divided into numerous smaller fibres or branches, that are dispersed throughout the body.

The nerves have been supposed to contain a very subtle fluid, which may be either of a magnetic or electrical nature; and though the nervous fibrils, when examined with the microscope, appear to be solid bodies, yet they probably conduct a very subtle fluid by means of their interstices. Thus, they are the immediate instruments of sensation, and are indispensably necessary for the continuance of muscular motion.

Wounds are the chief accidents to which the nerves are liable; but as the former require immediate chirurgical assistance, we shall only remark, that the nerves of several animals are larger than those of man; though possessing a very inferior degree of sensation. Indeed, the mental capacities of beings are by no means proportioned to the size of their nerves, proceeding from the brain: amphibious animals, for instance, possess strong nerves, in proportion to the diminutive size of their brain; and are nevertheless uncommonly dull of apprehension, and even insensible. On the contrary, children affected with the rickets, and persons of lean habits, have a large brain, and very delicate nerves; yet they possess not only a high degree of mental vigour, but likewise uncommon acuteness in the perceptions of sense.

Nervous diseases are supposed to arise from an increased sensibility of the nerves, under the influence of some stimulus; and are principally distinguished by their predominant *painful* symptoms; for instance, violent head-ach, tooth-ach, face-ach, &c. Hence the absurdity of classing almost every complaint, the origin of which is not obvious, among the *nervous*, and to misapply this term to disorders of a very different nature, such as general weakness, occasioned by muscular relaxation, or mental imbecility, peevishness, want of resolution, &c. if connected with bodily causes, however distant or concealed.

NETTLE, or *Urtica*, L. a genus of plants, comprising 57 species, three of which are natives of Britain; namely,

1. The *urens*, or LESSER STINGING NETTLE, which is frequent on rubbish and cultivated lands; it flowers from July to September. The leaves of this species, according to LINNÆUS, are gathered and cut to pieces, in order to be mixed with the food of young turkies—the whole plant is refused by every kind of cattle, and ought therefore to be carefully extirpated from pastures.

2. The *dioica*, or COMMON NETTLE, grows on ditch-banks, and among rubbish; it flowers in the month of July. This species has a square, firm stem, three or four feet high, with long-pointed, serrated leaves, that are furnished with stings, having at their base small vesicles full of a corrosive liquor; and which, on being touched, excite a blis-

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rally considered as a noxious weed, is of extensive utility: its young tops may be boiled during the spring, and eaten as a substitute for greens; being not only nourishing, but mildly aperient. In the Western Islands of Scotland, a rennet is prepared, by adding a quart of salt to three pints of a strong decoction of nettles; a table-spoonful of which is said to be sufficient to coagulate a bowl of milk. The leaves are employed for feeding poultry; and, especially in the winter, when boiled, they promote the laying of eggs—in a fresh state, they are refused by horses, sheep, goats, cows, and hogs; though asses devour them eagerly. When *dry*, they are eaten by cows, for which they are an excellent food, increasing the quantity, and improving the quality, of their milk. According to M. Van Geuns, such fodder is an effectual preservative against the contagious distemper affecting horned cattle.

The roots of the Common Nettle, when boiled, communicate a yellow tinge to yarn. But the most valuable part, is its fibrous stalk or stem; which, on being dressed in a manner similar to flax or hemp, has, in some parts of Europe, been advantageously manufactured into cloth. This useful branch of industry has also been attempted in Britain, and a coarse kind of durable canvas was produced, which is considerably harder than the cloth manufactured from hemp or flax. As, however, this plant requires a rich soil to obtain it in any quantities, and, as a much greater degree of attention and accuracy is necessary in the operation of *rating*, than is requisite either for flax or hemp, Dr. Anderson is of opinion, that the cultivation of the nettle will be attended with difficulty. From the rind, as well as the woody substance of the stalk, Dr. Schaeffer has produced a very good white writing paper; though that manufactured by M. De Villette, in France, was of a dark green colour. The seeds on expression, afford an useful lamp-oil.

In a medical view, the whole plant, and particularly the root, is esteemed to be *diuretic*; and has, therefore, been recommended in the jaundice and in nephritic complaints. A leaf, if placed on the tongue, and pressed against the roof of the mouth, is said to be efficacious in bleeding at the nose; and instances have occurred, in which paralytic limbs have been recovered by stinging them with nettles. If credit be due to some authors, the expressed juice of this plant is a valuable remedy to the asthmatic and consumptive.

Some interesting experiments have been made by M. Zannetini, in Italy; from which it appears that the flowers and seeds of the Common Nettle may, with efficacy, be substituted for the Peruvian bark, in all febrile affections, especially in tertian and quartan agues. This native vegetable operates more speedily than the foreign bark; and, in large doses, induces a lethargic sleep: the portion to be given ought never to exceed one drachm, and should be administered in wine, two or three times in the course of 24 hours. The same cautions that are necessary in the use of the Peruvian bark, are likewise to be observed in taking the seeds and flowers of the nettle. Lastly, M. Zannetini recommends a slight infusion of the latter, in wine, as an excellent preservative for those who reside in marshy and unwholesome situations.

3. The *pilulifera*, or Roman Nettle, growing among rubbish, and on old walls. It is found chiefly in the vicinity of Yarmouth, and on the eastern coast of England; it flowers in the month of August.

Both the last mentioned species possess similar properties; and, as the Common Nettle, in particular, acquires the height of six feet, when sown in September or October, on an indifferent soil, Funke strongly recommends its culture; nay, he maintains, that after the second year of its growth, it thrives rapidly, reproduces itself annually, and may be mown two or three times every year. In this respect, it promises to become an excellent fodder for cattle.

NETTLE-HEMP, or *Galeopsis*, L. a genus of native plants, consisting of four species, the principal of which is the *tetrahit*, Common Hemp-nettle, or Nettle-hemp, All-heal. It grows in hedges, corn-fields, and among rubbish; flowers in the months of July and August. In Thuringia, the small seeds of this plant are collected by the poor, and not only sold in considerable quantities as food for birds, but their sweet-oil likewise is expressed; as it affords an excellent supply for chamber lamps. Hence Bechstein advises the cultivation of this vegetable, chiefly on account of its mild salad-oil, which the seeds yield in a large proportion.

NETTLE-RASH, or *Urticaria*, a cutaneous disease, thus denominated, from the resemblance of the eruption to that produced by the stinging of nettles. Numerous pimples appear on the skin, often suddenly after rubbing or scratching it; though they generally vanish in a few hours, and sometimes in a few minutes.

The nettle-rash affects some persons only for one or two hours; others for a few days; while in some it continues for several months, and even years. It more commonly attacks females than males, and children oftener than adults; but it is not infectious.

The cause of the nettle-rash is ascribed, by Dr. Heberden, to some mechanical object, applied to the skin, such as cowhage, or the spiculæ of cantharides adhering after the removal of blisters; though the disorder may be induced by eating muscles, lobsters, shrimps, and even honey, as likewise from partaking of fish not sufficiently dressed, or of fresh pork, &c. so that the foundation of it appears to be laid in the organs of digestion, which prepare a coarse chyle, consequently crude and acrid fluids. From whatever cause this affection may arise, Dr H. conceives that it does not corrupt the humours, so as to require *internal* remedies: he is of opinion that, if the itching could be speedily mitigated, no farther medicine would be necessary. For this purpose, a mixture of oil, vinegar, and spirit of wine, may be applied to the skin, and will afford a temporary relief; though Prof. Starck, of Jena, believes this eruption (when it is of a *periodical* or *chronic* nature) to originate from a diseased viscus or intestine; and therefore prescribes, first, sudorifics and diuretics, then resolvent and strengthening medicines; but especially the copious use of Seltzer water.

NEUTRAL-SALTS, in chemistry, those compounded of an acid, and any other substance capable of uniting with it, and destroying its acidity. See Salts.

NEUTRALIZATION, in chemistry, when substances mutually disguise each other's properties, they are said to neutralise one another. This property is common to a great number of bodies; but it manifests itself most strongly, and was first observed in the acids and alkalies. Hence the salts obtained from the combination of these different bodies, received the name of neutral salts.

NEWS-PAPERS, periodical publications, daily, weekly, &c. for the purpose of communicating to the public every thing of importance, whether political, literary, &c. They were first published in England in 1642; in France, 1665; in America, 1704. See Gazette.

NEW-STYLE, first used in England in 1753, was introduced to the western world by Pope Gregory XIII The old-style, which is still used in Russia, is eleven days behind the reckoning of the new: that is, the 1st of March O.S. is the 11th N. S.

NICKEL, a white metal, which, when pure, is ductile and malleable. *Its colour* is intermediate between that of silver and tin, and is not altered by the air. It is nearly as hard as iron, and its specific gravity is eight or nine times greater than that of water. Nickel forms alloys with a number of metals.

NICTITATING MEMBRANE, a very thin and fine skin, chiefly found in the bird and fish-kind, which covers the eyes of these creatures, sheltering them from dust, or from too much light, yet is so thin and pellucid, that they can see through it.

NIGHTINGALE, or *Motacilla lucinia*, L. a small bird, remarkable for the melody of its notes: the feathers of the head, neck, and back, are sallow; the wings and tail brighter than the rest of its body; and the whole creature weighs scarcely one ounce.

Nightingales are birds of passage, probably from Asia, visiting Britain in the beginning of April and returning to the warmer climates in August;—they never unite in flocks, and their habitations are generally at a distance from each other. The female constructs her nest in low bushes or quickset hedges, well covered with foliage, in the vicinity of brooks; it is externally composed of dry leaves, mixed with grass and fibres, and lined with hair or down: here she deposits four or five olive-green eggs. During the period of incubation, the females alone sit on the eggs, while the males in the vicinity, in a manner emulate with their melodious songs; but they cease to exert their powerful voice as soon as the young are hatched, when they assist in feeding their nestlings.

There are two varieties of this bird, namely, those with a larger and longer body, which sing only at night; and others which are smaller, of a colour inclining to a red shade, and warble more frequently during day-light. Sometimes also, they are of a whitish cast but rarely met with in our climate

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worms; as their diet, in general agrees with them better, when mixed with animal food. These birds are subject to various diseases, which according to some ornithologists, may be averted by giving them, in the month of March, one black spider every day, for six days in succession.

NIGHT-MARE, or *Incubus*, a singular affection, occasioned by a spasmodic state either of the lungs or the abdomen; by a redundancy of blood, or a partial stagnation, in its passages through the heart and the pulmonary vessels.

During this affection, the patient perceives, or imagines that he feels, an uncommon oppression in the region of the breast and stomach, which no effort can remove.—Sometimes he groans, and screams, but more frequently in vain endeavours to speak. At other times he fancies himself struggling with an enemy, or with demons; to be in a house that is in flames; or in danger of being drowned, &c. so that the terror induced by the frightful ideas which accompany these uneasy sensations, causes a tingling in the ears, and produces a general tremor.

The night-mare chiefly attacks nervous, hypochondriac, or delicate persons, when lying on their back: beside the causes above stated: it may, in many instances, be assigned to *indigestion*. Hence persons of sedentary habits and weak nerves, especially those who are subject to flatulency, ought carefully to avoid all coarse and heavy nutriment; to eat light but nourishing food; to abstain from late or solid suppers; and lastly, to raise their heads in bed tolerably high. As those who are attacked with the night-mare generally groan when labouring under a fit, it will be requisite to address or *wake* them instantly, as the uneasiness will thus be greatly removed. Should, however, the paroxysm continue to increase, it will be useful to administer small, but frequent doses of valerian, asafœtida, or other antispasmodics, and to strengthen the body with the mildest chalybeates. But if young persons of plethoric habits be subject to this affection, it will be advisable to use a spare diet, to take daily exercise in the open air, and to attend to the state of the bowels, in order to prevent costiveness.

NIGHTSHADE, or *Solanum*, L. a genus of plants, comprising 66 species; of which only two are natives of Britain; namely,

1. The *Dulcamara*, Bitter-sweet, or Woody-Nightshade, growing in all moist brakes, hedges, and on the sides of cold brooks and ditches, where it flowers in the months of June and July. It endures ten years in the same soil, and attains in the shade, the height of seven feet; but, if there be no shrubs in their vicinity, the shoots creep along the ground, and frequently strike *new roots*. On account of their depth, the plant is uncommonly useful towards consolidating dams and banks of rivers. Boerhaave informs us, that the bitter-sweet is far superior to sarsaparilla; and, according to Linnæus, an infusion of the young twigs is eminently serviceable in acute rheumatisms, inflammations, fevers, &c. It has also been found very efficacious in cases of asthma, jaundice, and of the scurvy; for which purposes, Dr. Hallenberg directs a pint of boiling water to be poured upon two drachms of the stalks, previously sliced and dried: after standing half an hour, the whole must be boiled for about fifteen minutes. The dose is two tea-cupfuls, or more, in the morning and evening. The stalks may be gathered early in the spring, or late in autumn; in smell, the root of this vegetable resembles that of the potatoe. Its beautiful red berries have a disagreeable taste; and possess deleterious properties. Sheep and goats eat the dulcamara, but horses, cows, and swine refuse it.

2. The *nigrum*, Common Nightshade, or Garden Nightshade; which grows among rubbish, on dung-hills, and in kitchen gardens: it flowers from June to October. Though generally considered as a poisonous weed, the Dalmatians fry it in butter, and eat this dish with a view to procure a comfortable sleep; an effect which the writer of these pages had occasion to witness. From one to three grains of the leaves, infused in boiling water, and taken at bed-time, induce a copious perspiration, increase the secretion of urine, and generally operate as a laxative on the following day. Hence this simple preparation, if judiciously administered, may prove of great service in several affections; but its influence on the nerves is too precarious to admit of its use, without professional advice. The leaves, externally applied, abate inflammation and assuage pain; the flowers possess the odour of musk. The whole plant is refused by every kind of cattle.

NIGHTSHADE, the Deadly, Dwarf-

BERRIES, or DEADLY DWALE; the *Solanum lethale*, or *Atropa Belladonna*, L. in indigenous plant, growing in hedges, among lime-stone and rubbish; it flowers in the month of June or July. The whole of this plant is poisonous; and children, allured by the beautiful appearance of its berries, have too often experienced their fatal effects. The most proper antidotes, in such accidents, are strong emetics, large draughts of oil and vinegar, purgatives, blisters applied to the neck; and, after the poison has been ejected from the stomach, the tincture of castor, in small doses of ten or fifteen drops, should be diluted in a spoonful of water, and taken every two or three hours. It is asserted, that tumours of the breasts, even of the cancerous kind, have been resolved by a local application of the fresh leaves. A poultice prepared of the roots, boiled in milk, and applied to hard ill-conditioned ulcers, has sometimes effected a cure. Although the internal use of this medicine, and its great efficacy in the most obstinate diseases, such as hydrophobia, epilepsy, melancholy, madness, and the distemper of cattle, is attested by many eminent continental writers, yet we do not advise our readers to venture upon a remedy so powerful and dangerous in its effects. The juice of the berries, when ripe, imparts to paper a beautiful and durable purple. Sheep, rabbits, and hogs, eat the leaves of the Deadly Nightshade without the least injury; nay, experience has evinced, that the last mentioned animals have, by the use of this herb alone, been effectually cured of the inflammatory distemper, to which they are subject in dry seasons.

NIPPLE, a small prominence arising from the middle of the female breast. The lacteal tubes terminate in these projections, through which the milk is drawn in the act of sucking.

The nipples of females, when suckling their first child, are frequently so diminutive and deep within the breast, as to render it difficult or impracticable for the infant to extract the milk. In such cases, the young mother should frequently, though cautiously, protrude the nipple between her fingers, by depressing the projecting part of the breast; and afterwards covering the protuberances with an excavated nutmeg, to be worn several weeks previously to her delivery. But if this expedient prove insufficient, it will be advisable to draw the breasts, either by presenting them to a *healthy infant*, several months old; or by applying Mr. SAVIGNY's small air-pump contrived for that purpose; and which is far preferable to the common breast-glasses, as well as to the disgusting practice of employing quadrupeds.

Another inconvenience incident to nipples, frequently arises from chaps or excoriations. These are not only painful to the mother, but also prevent the infant from drawing the necessary supply of milk. In some instances, even part of the substance of the nipple is destroyed by violent suction; so that the mother, from the intense pain thus occasioned, is obliged to refuse the breast; and a stagnation of the milk takes place, which is often accompanied with ulcerations and fever. To prevent such dangerous affections, the practice of raising the nipples, as before suggested, should be timely adopted; but, if the parts be already in a diseased state, it will then be useful to bathe them with lime-water, or diluted port-wine; after which the nipple should be dressed with a little spermaceti ointment. Before, however, such applications are resorted to, it will be preferable to anoint the sore part with a composition of white wax and olive-oil, and to cover it with a fine linen rag; by which simple means great relief may often be obtained.

These remedies will, in general, be found sufficient; but, if the nipple receive no benefit, it has been recommended to apply the neck, together with part of the body, of a hog's bladder (or cow's teat taken from a healthy animal,) to the part affected. Either of these, if properly moistened and fixed to the breast, will effectually protect it, while the infant is sucking; and when not in use, the bladder or teat may be preserved in a little spirit of wine, which will prevent it from putrefying. See also THRUSH.

NIPPLE-WORT, or *Lapsona*, L. a genus of plants, comprising five species; one of which is indigenous, namely, the *communis*, Common Nipple-wort, or Dock Cresses. It grows in hedges, shady places, and on rubbish; where it flowers in the months of June and July. The young and tender leaves of this vegetable have the flavour of radishes, and may be eaten raw, as salad. Though possessing a bitter taste, they are a wholesome vegetable; and in some

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ed of the nitric acid, and alkalies, earths, &c. The most important of these is Nitre, which see.

NITRE, or Salt-petre, is a species of salt, which, in Persia and the East Indies, is extracted from certain native earths. It is likewise artificially produced in several parts of Germany, Hungary, and especially in France; either from the rubbish of old clay-walls and ceilings, or from animal and vegetable matters suffered to undergo putrefaction, which is promoted by the addition of ashes and of lime; when the whole is exposed for a considerable time, but under shelter, to the access of the air, in a direction from north to south.

Nitre is of a sharp, bitterish, penetrating taste, followed by a sensation of coldness. When pure, it dissolves in about six times its weight of water, and, on evaporating the latter, concretes into transparent crystals. It easily melts in the fire; where it deflagrates with a bright flame, accompanied with a crackling noise, and afterwards deposits a large portion of alkaline earth.

Salt-petre is of great utility both in the arts and in medicine. Its spirit, known under the name of Aqua-Fortis, is extensively employed both in dyeing, and in refining, as well as for other purposes, the principal of which we have already stated.

[Purified nitre is prescribed with advantage in numerous disorders: as a diuretic in doses of from 20 to 30 grs.: and when combined in that quantity with a grain of emetic tartar, it is an useful febrifuge. It consists of 44 parts acid, 52 potash, and 4 water.—T. C.]

NITRIC-ACID, is a compound of oxygen and nitrogen or azote. The two principal constituent parts of our atmosphere, which, in certain proportions form the common air, do, in other proportions, yield one of the most powerful of all the acids. This consists of 70.5 of the oxygen and 29.5 of nitrogen. The nitric acid is of considerable importance in the arts. It is employed in etching copper; as a solvent of tin to form with that metal a mordant for some of the finest dyes: in medicine and various chemical processes. A compound made by mixing two parts of the nitric acid with one of the muriatic, is that which was formerly called the aqua regia, and is now known by the name of nitro-muriatic acid: it has the property of dissolving gold and platina. The nitric acid is obtained in the large way from nitre.

Nits (in Horses.) See Staves-acre.

NODES, in astronomy, the two points in which the orbit of a planet intersects the ecliptic. These are called the ascending and descending nodes. The line in which the two circles intersect is called " the line of the nodes." This line, as it refers to all the planets, shifts its situation from east to west, contrary to the order of the signs.

Nonsuch. See Trefoil Medick.

NOSE, in anatomy, the external organ of smelling, or that part which projects from the middle of the human face.

The nose is subject to various affections, such as ulcers, luxations, fractures, &c. the treatment of which is foreign to our purpose: we have already discussed the subject of hæmorrhages, under the article Bleeding.

If the nose of an infant be obstructed with any gross matter, so as to impede respiration, or to prevent him from sucking or swallowing, it will be advisable, every evening, to anoint the part with a little sweet-oil, or fresh butter. By this simple application, the gross particles will in most instances be dissolved, and the faculty of breathing speedily restored. Should, however, the obstructions continue after the repeated use of this remedy, it will be necessary first to administer one or two gentle laxatives; such as a teaspoonful of castor-oil, or a grain of rhubarb; after which the nose is to be frequently bathed with a linen rag, dipped in a filtered solution of two or three grains of white vitriol, in one ounce of marjoram-water.

NOSTOCH, the name of a vegetable substance, which seems to differ from almost all others of the same kind. It is of a greenish colour, partly transparent, and of a very irregular figure. It trembles at the touch like jelly, but does not melt like that. It is found in almost all kinds of soils, sometimes on gravel walks after rain. (*Tremelia nostoc.*)

NOSTRILS, are two apertures or cavities of the nose, through which the air passes. These apertures are divided from each other by a cartilage: they are lined with a very sensible membrane, and answer the conjoint purposes of smelling, respiration, and speech.

As the delicate membrane which lines the nostrils, is the common integument of the mouth, and other interior vessels, it will be readily conceived, that its exposure to sudden changes of temperature, must be productive of injurious consequences. Hence the necessity of guarding against, *cold*, when hastily leaving the fire-side for encountering the frosty air of winter, or returning from the latter to a heated room. Although the frequent colds and catarrhs are generally considered as trivial, and too often neglected, yet we are persuaded, that by far the greater number of consumptive and asthmatic sufferers date the period of their declining health from such inattention. We therefore recommend to those who are yet susceptible of advice, previously to exposing themselves to a damp, cold, or sharp air, to spend a few minutes in a cool, temperate room, or to apply a handkerchief to the mouth, when suddenly coming in contact with the external air, till they become gradually accustomed to its stimulus. Thus, we doubt not, many complaints of serious consequences, might be easily prevented.

NOSTRUM, denotes any medicine the composition of which is supposed to be secret, and confined to the knowledge of one, or a few individuals.

NOTONECTA, the *boat-fly*, a genus of insects belonging to the order of *hemiptera*, of which there are fourteen species, and seven of these common in Europe.—The following is the description of the *notonecta glauca*: its legs are long, and when taken out of the water it hops; it is very common in the ponds of water in Hyde-park, and in several places about London. It is of a very particular form, being flattish at the belly, and rising to a ridge in the middle of the back; so that when it swims, which it does almost always on its back, its body has much the resemblance of a boat in figure, whence its vulgar name. It is eight lines long, three broad, and two and a half thick. Nature has provided it with an offensive weapon resembling a sting. It must be cautiously handled by those who would avoid being pricked by it, for the point of its rostrum is exceedingly sharp and intolerably painful; but the sensation goes off in a few minutes. The head is large and hard; the eyes nearly of a triangular form; the nose, a long green hollow proboscis, ending in a hard and sharp point, which, in its natural posture remains under the belly, and reaches to the middle pair of legs. The outer pair of its wings are of pale flesh colour, with spots of a dead white; they are long, narrow, and somewhat transparent; they terminate in a roundish point, and perfectly cover the whole body. The triangular piece which stands between the top of the wings is hard, and perfectly black; the inner wings are broader and shorter than the outer ones; they are thin, perfectly transparent, and of a pale pearl colour. The hinder pair being longer than the rest, they serve as oars; and nature has tufted them with hair for *that* purpose. This creature mostly lives *in the* water, where it preys on small insects, killing them and sucking their juices with its proboscis, in the manner of the water scorpion, and many other aquatic insects: it seizes its prey violently, and darts with incredible swiftness to a considerable distance after it.

Though generally an inhabitant of the water, it sometimes, in good weather, crawls out, drying its wings, by expanding them in the sun, and takes flight: in this new situation it is not to be known for the same creature, unless by those who have accurately observed it.

NOVEL, a fictitious history, written with a view to exhibit the emotions of the human heart; the happiness and misery of private life; the effects of indulging the passions, and especially that of Love.

The origin of modern novel-writing, together with the requisites essential to an interesting work, we leave to the discussion of the critic. There are, indeed, too many publications of this nature; but the generality of such performances, instead of inspiring the young mind with the love of virtue, and a detestation of vice, are only calculated to excite the most insidious and sensual ideas: hence we think it our duty to caution parents with respect to the purity of such compositions as may fall into the hands of their unguarded children.

As the design of novels or romances is the interest of the human heart, they are too apt to lead it astray, unless written in a chaste and correct style. Numberless are the victims of delusion, especially in great towns, whose wretched state commenced with the indiscriminate perusal of seductive novels. Nor is this evil confined to the middle ranks of society, in cities, or to boarding schools. The farm-house and the cottage, in many parts of England, furnish subscribers to circulating libraries, at the distance of several miles from the town or village, where the most absurd, and frequently immoral narratives (provided they are handomely printed,) are eagerly read, and ignified with the title of a "Novel."

By these brief strictures, we by no neans intend to proscribe the dissenination of knowledge, particularly mong the lower classes. There unloubtedly are novels (though few in umber), which deserve to be perused y inexperienced youth, and which relect credit on their authors. [Such as he novels of Miss EGEWORTH, and the uthor of Waverley. But the novels f the last century by FIELDING, SMOLLET, and RICHARDSON, are neither calculated to improve the taste or the morals, notwithstanding the talent displayed in their composition.—T. C.]

NOURISHMENT, in animal economy, denotes the reparation of the continual waste which bodies undergo in consequence of exercise, the effects of air, hunger, thirst, sleep, &c.

Nutriment is afforded by proper food containing alimentary juices, and which, after due mastication, is digested in the stomach, converted into chyle, incorporated with the blood, and thus distributed throughout the body for its support. In young persons, the nutritious juices not only contribute to restore the continual waste, but also to increase their size, which is denominated *growth*. In adults, likewise the epidermis, or scarf-skin, though continually peeling off, is always renewed; and, if any muscular parts be separated from the body, they are speedily supplied with new substance: in a similar manner, wounds heal spontaneously; and such persons as are emaciated or exhausted, again grow plump, and even become lusty. See DIGESTION and FOOD.

NURSE, a woman who professes to rear young children, or to attend sick persons.

The duties incumbent on nurses, whether intended for the management of infants, or of patients, are equally important. Hence the utmost precaution is requisite to select such as are *cleanly*, in good health, and uncontaminated by any latent disease, especially if they be destined to suckle children: for, it is a melancholy truth, that the hopes of many families have sunk into an early grave, after they had intrusted their offspring to nurses, who were tainted with the scurvy, or other fatal disorder. Such vigilance, therefore, ought not to be relaxed, even though proper persons have been procured; because there are many, who from selfish and superstitious motives, will not hesitate to use the most hurtful means of lulling the child to sleep: thus, the innocent babe is early inured to the taste of *spirits*, which it retains even at a maturer age, and insensibly becomes the most detestable of characters, a *drunkard*. To prevent these and similar abuses, we would seriously advise all parents to visit their children, not merely on Sundays, but as often as their time will permit on other days of the week; as these unexpected calls will enable them easily to ascertain, either the propriety, or mal-practices, in the conduct of those persons to whom they may have committed the care of their children.

With respect to *sick nurses*, we cannot omit to observe, that they ought to be *cleanly* and *warmly* clad. If they are obliged to attend their patients during the night, it would be advisable (especially in dangerous cases, and where the expenses can be afforded) always to employ *two* nurses, so that the one may relieve the other; and the afflicted may receive that prompt attention, which many of those mercenary hirelings unwillingly bestow. Indolence and slight, however, are not the only evils, to which the unresisting patient is often doomed to submit. During the destructive plague, which depopulated London city, in the reign of CHARLES II. the merciless miscreants who had the charge of the infected, not only plundered them while expiring, but even terminated their existence by violence, and had the audacity to attribute their decease to the malignance of the distemper!

The mind shudders with horror at the recollection of such atrocious crimes, and is tempted to hope, for the sake of humanity, that such outcasts of society no longer exist. But, alas! instances have repeatedly and lately occurred, in which the cap has been removed, and a better one substituted; nay, the rings were torn out of the patient's ears, while in the agonies of death. The finest linen has been found on the bed, damp and unaired, being the nurse's perquisite, when her hapless victim is no more; and other cruelties have been committed, the enumeration of which would shock the feelings of the most phlegmatic reader.

Although it is painful to record atrocities which degrade human nature, yet they cannot be too generally known, that all persons may be rendered vigilant in the selection of those who are appointed to attend the sick. It is not however, our intention to insinuate, that all nurses are thus depraved. There may, doubtless be found persons whose humanity and attention to the diseased, render them worthy of the greatest commendation; but the safety and welfare of society seems to require, that proper measures be taken, to prevent the repetition of such enormities for the future; and we trust, that considerable benefit would result from an institution, the object of which should be the appointment of proper nurses; so that none be permitted to perform that important office, unless provided with a certificate, signed by three or more medical practitioners.

NURSERY, in horticulture, a piece of land selected for raising or propagating plants and trees, with a view to supply both gardens and plantations.

As we state, under distinct heads, the mode of cultivation to be adopted in the rearing of plants, both when in the nursery, and also after their removal to the spot where they are intended to remain, we shall at present communicate a few general hints and directions.

I. A nursery ought to be situated contiguously to the dwelling-house, that it may be conveniently inspected in every season: it should likewise be in the vicinity of a brook or rivulet, in order that there may be a constant supply of water, during the hot days of summer.

II. If it be intended f[illegible] timber-trees, MILLER advises the n[illegible] to be formed on the ground wh[illegible] signed for the future planta[illegible] hat a sufficient number ma[illegible] red to stand, when the other [illegible] en removed.

III. The [illegible] ppropriated to *flowers*, oug[illegible] exposed to the south, but [illegible] same time sheltered from str[illegible] s, either by means of trees o[illegible] s.—The soil should be light [illegible], especially for bulbous-root[illegible].

[illegible] n respect to *fruit-trees*: [illegible] d ought to be fresh, rather d[illegible] moist, and not richer than that into which they are finally to be transplanted. 2. It should be carefully inclosed, to exclude hares, rabbits, and all other animals that infest young plantations; after which the ground must be diligently cleared from all weeds, and *trenched* to the depth of

October. 3. On the approach of the planting season, the trenches must be filled up, the soil be laid as level as possible, and divided into equal quarters, which ought likewise to be subdivided into beds, wherein may be sown the seeds or stones of the fruit intended to be reared. Lastly, when a sufficient number of *stocks* is obtained, they must be removed into such soils, and exposed to such situations, as the nature of each fruit may require.

NURSERY, in domestic life, denotes an apartment devoted exclusively to the rearing and accommodation of children.

The room designed for this purpose ought to be lofty, perfectly dry, and in the attic story of the house, or at least above the ground-floor. Another requisite to nurseries is, that they be spacious and airy, so that their young inhabitants may have sufficient room to exercise themselves, when the inclemency of the weather prevents them from partaking of the benefit of the open air. Too many windows, however, afford too strong a light for infantine eyes, and the rays of the sun are, to their weak organs, not less hurtful than close walls, and dark apartments.

Cleanliness ought particularly to be attended to; and every care should be taken to render the air of nurseries perfectly dry and pure. Whatever tends to corrupt the atmosphere, must therefore be studiously avoided. No damp linen, or swaddling clothes, should be washed, or suspended for drying in such apartments; nor should any provisions, especially animal food, be cooked there; for all these processes vitiate the atmosphere, and produce exhalations which are highly injurious to the eyes of infants; frequently occasioning chronic inflammations in those organs. The nursery ought, likewise, to be carefully swept every day, while the children should be removed at least into another room, if the weather prevent them from making excursions abroad.

Lastly, in case the air of the nursery has become corrupted by accident, the windows should be frequently opened, to promote its purification, by the influence of the fresh atmosphere, which is far preferable to fumigations with frankincense, or similar aromatics; for, extremely hurtful, especially if the children be descended from weakly parents.

[NUT-GALLS, excrescences of the oak, very astringent, and used to make ink and to dye black colours, and those wherein a shade of black enters, as grey.—T. C.]

NUTMEGS are the kernels of a fruit produced in several islands of the East Indies.

They are each immediately surrounded by the spice called *mace*, and, externally, by a husk about half an inch in thickness, which has somewhat the appearance of a small peach, both in shape and colour, with the exception of its being pointed towards the stalk.

The nutmeg-tree (*Myristica aromatica*) is not unlike our common cherry-tree, both in growth and size. Its leaves are nearly oval, but pointed, waved, obliquely nerved, of bright green colour above, and whitish beneath. The flowers are small, and hang upon slender stalks.

When this fruit is nearly ripe the husk opens at the end, and exposes a net-work of scarlet mace. Underneath the mace is a black shell about as thick as that of a filbert, and very hard; and in this is contained the nutmeg.

The gathering of *nutmegs* is performed by persons who ascend the trees for that purpose, and pull the branches to them with long hooks. The husks are stripped off in the woods, and the remaining part of the fruit, with its surrounding mace, is taken home. After the mace has been carefully stripped off with a small knife, the nuts which are still covered with their woody shell, are dried, first in the sun, and then upon a frame of split bamboos placed over a slow fire, until, when shaken, the kernels are heard to rattle within the shells. These now easily fly to pieces when beaten with small sticks; and the nutmegs, being taken out, are soaked in sea-water and lime, and are then thrown in great numbers to heat, by which their vegetating principle is destroyed. The nutmegs are finally sorted into parcels, according to their quality, and packed in bags for sale and exportation.

The quantity of nutmegs vended at the East India Company's sales in 1804 amounted to 117,936 pounds' weight, and produced 54,733*l.* exclusive of the duties. This kind of spice has long been employed both for culinary and medicinal purposes. Distilled with water they afford a large portion of essential oil, which resembles in flavour the spice itself. When heated and pressed, the nutmegs yield a considerable quantity of limpid yellow oil. In the shops a thick and fragrant kind is sold, which, though called *oil of mace*, is in reality expressed from the nutmeg. The best oil of this description is imported from the East Indies in stone jars. Oil of nutmegs is chiefly made from the imperfect fruit, and such as would be unfit for the European market.

Mace, or the covering of the nutmeg that lies betwixt the outer coat and the shell, is an unctuous membrane, first of a light red, and afterwards when dried, and as we see it, of yellowish colour. When taken from the shell it is exposed to the sun, afterwards moistened with sea-water, and finally so far dried as to allow of its being packed in bales for exportation. In these it is pressed closely down, by which its fragrance and peculiar qualities are preserved. Mace is liable to seizure if imported in packages of less than 300 pounds' weight. We usually see it in flakes each about an inch in length, and presenting a variety of ramifications. This piece has a very fragrant and agreeable odour, and, to most persons, a pleasant though somewhat acrid taste. It possesses a pleasant though somewhat acrid taste. It possesses nearly all the virtues of the nutmeg, but with less astringency; and, like that, employed in numerous ways, both in culinary preparations and medicine.

In the island of Banda it is sometimes customary to boil the *entire fruit* of the nutmeg-tree, and afterwards to preserve it in syrup, and also to pickle it in spiced vinegar, in nearly the same manner as we pickle walnuts. In several parts of the East the inhabitants preserve the *outer husk* as a sweetmeat, or eat it stewed with other food.

With respect to their effects on the human body, nutmegs are strongly aromatic, and stomachic: hence this drug has often been used for diarrhœas and dysenteries, in doses from [illegible] to 20 grains in powder, or in larger quantities, when infused in port wine. In violent head-achs, arising from a debilitated stomach, *small doses* of this medicine have frequently been found of real service; but, if injudiciously employed, it is apt to infect the head, not unlike opium and other powerful narcotics.—The officinal preparations of nutmeg are, a spirit, and an essential oil: the nutmeg in substance is also roasted, to render it more astringent.—See Mace.

NUX VOMICA, a flat, compressed, round fruit, about an inch in diameter, of a greyish-brown colour, of a horny consistence; and the surface of which is somewhat wrinkled. It is the produce of a tree growing in the East Indies; possesses a bitter taste, and has been found a certain poison for dogs, cats, fish, &c. Nevertheless, this highly deleterious fruit has lately been employed on the continent of Europe, as a medicine of great efficacy, in spasmodic affections of the bowels, especially in the contagious dysentery, as well as in obstinate quartan agues, &c. But, as its administration can be directed only by professional men, we forbear to mention the proper doses, and shall only observe, that the London brewers have frequently been suspected of adulterating their ale and porter with this narcotic drug, in order to render them more intoxicating, though such charge has, to our knowledge, never been proved in a court of justice. [Great use of it is made for this purpose in the United States.—T. C.]

NYCTALOPIA, a disorder of the eye, in which, through weakness it can discern objects only by night, or in obscure places. This is a constitutional defect, not to be cured. Anatomists attribute it to the want of a constituent part of the animal substance, called the *rete mucosum*, which gives colour to the complexion, hair, and eyes.

NYMPH, (in Botany) see Chrysalis.

END OF VOL. II.